ABSTRACT

In this assignment we have selected ICC Worldcup 2019 as our domain consisting of the following data sets

1. ICC_CWC_19_teams
2. ICC_CWC_19_players
3. ICC_CWC_19_boards

ICC_CWC_19_Teams being a large data set was normalised into different data sets so as to have the database in 1NF,2NF,3NF.

1. ICC_CWC_19_Teams

In [1]:

```
import pandas as pd
ICC_CWC_19_Teams= pd.read_csv('D:/Northeastern University/Data Management & Database Design/Assignment 2/Chandramouli_Rohit Prasanna_INFO 6210_Assignment2/ICC_CWC_19_Teams.csv')
ICC_CWC_19_Teams
```

Out[1]:

	Player_name	Team_ID	Team_name	Coach_name	Board_name
0	Gulbadin Naib (c)	1	Afghanistan	Phil Simmons	Afghanistan Cricket Board
1	Rashid Khan (vc)	1	Afghanistan	Phil Simmons	Afghanistan Cricket Board
2	Aftab Alam	1	Afghanistan	Phil Simmons	Afghanistan Cricket Board
3	Asghar Afghan	1	Afghanistan	Phil Simmons	Afghanistan Cricket Board
4	Dawlat Zadran	1	Afghanistan	Phil Simmons	Afghanistan Cricket Board
5	Hamid Hassan	1	Afghanistan	Phil Simmons	Afghanistan Cricket Board
6	Hashmatullah Shahidi	1	Afghanistan	Phil Simmons	Afghanistan Cricket Board
7	Hazratullah Zazai	1	Afghanistan	Phil Simmons	Afghanistan Cricket Board
8	Mohammad Nabi	1	Afghanistan	Phil Simmons	Afghanistan Cricket Board
9	Mohammad Shahzad (wk)	1	Afghanistan	Phil Simmons	Afghanistan Cricket Board
10	Mujeeb Ur Rahman	1	Afghanistan	Phil Simmons	Afghanistan Cricket Board
11	Najibullah Zadran	1	Afghanistan	Phil Simmons	Afghanistan Cricket Board
12	Noor Ali Zadran	1	Afghanistan	Phil Simmons	Afghanistan Cricket Board
13	Rahmat Shah	1	Afghanistan	Phil Simmons	Afghanistan Cricket Board
14	Samiullah Shinwari	1	Afghanistan	Phil Simmons	Afghanistan Cricket Board
15	Aaron Finch (c)	2	Australia	Justin Langer	Cricket Australia
16	Pat Cummins (vc)	2	Australia	Justin Langer	Cricket Australia
17	Alex Carey (wk)	2	Australia	Justin Langer	Cricket Australia
18	Jason Behrendorff	2	Australia	Justin Langer	Cricket Australia
19	Nathan Coulter-Nile	2	Australia	Justin Langer	Cricket Australia
20	Usman Khawaja	2	Australia	Justin Langer	Cricket Australia
21	Nathan Lyon	2	Australia	Justin Langer	Cricket Australia
22	Shaun Marsh	2	Australia	Justin Langer	Cricket Australia

	Player_name	Team_ID	Team_name	Coach_name	Board_name
23	Glenn Maxwell	2	Australia	Justin Langer	Cricket Australia
24	Jhye Richardson	2	Australia	Justin Langer	Cricket Australia
25	Kane Richardson	2	Australia	Justin Langer	Cricket Australia
26	Steve Smith	2	Australia	Justin Langer	Cricket Australia
27	Mitchell Starc	2	Australia	Justin Langer	Cricket Australia
28	Marcus Stoinis	2	Australia	Justin Langer	Cricket Australia
29	David Warner	2	Australia	Justin Langer	Cricket Australia
...	...	...	...	...	...
122	Dimuth Karunaratne (c)	9	SriLanka	Chandika Hathurusingha	Sri Lanka Cricket
123	Dhananjaya de Silva (vc)	9	SriLanka	Chandika Hathurusingha	Sri Lanka Cricket
124	Angelo Mathews	9	SriLanka	Chandika Hathurusingha	Sri Lanka Cricket
125	Avishka Fernando	9	SriLanka	Chandika Hathurusingha	Sri Lanka Cricket
126	Lahiru Thirimanne	9	SriLanka	Chandika Hathurusingha	Sri Lanka Cricket
127	Kusal Mendis	9	SriLanka	Chandika Hathurusingha	Sri Lanka Cricket
128	Kusal Perera (wk)	9	SriLanka	Chandika Hathurusingha	Sri Lanka Cricket
129	Thisara Perera	9	SriLanka	Chandika Hathurusingha	Sri Lanka Cricket
130	Isuru Udana	9	SriLanka	Chandika Hathurusingha	Sri Lanka Cricket
131	Jeffrey Vandersay	9	SriLanka	Chandika Hathurusingha	Sri Lanka Cricket
132	Jeevan Mendis	9	SriLanka	Chandika Hathurusingha	Sri Lanka Cricket
133	Milinda Siriwardana	9	SriLanka	Chandika Hathurusingha	Sri Lanka Cricket
134	Lasith Malinga	9	SriLanka	Chandika Hathurusingha	Sri Lanka Cricket
135	Suranga Lakmal	9	SriLanka	Chandika Hathurusingha	Sri Lanka Cricket
136	Nuwan Pradeep	9	SriLanka	Chandika Hathurusingha	Sri Lanka Cricket
137	Jason Holder (c)	10	WestIndies	Floyd Reifer	Cricket West Indies
138	Chris Gayle (vc)	10	WestIndies	Floyd Reifer	Cricket West Indies
139	Carlos Brathwaite	10	WestIndies	Floyd Reifer	Cricket West Indies
140	Darren Bravo	10	WestIndies	Floyd Reifer	Cricket West Indies
141	Sheldon Cottrell	10	WestIndies	Floyd Reifer	Cricket West Indies
142	Fabian Allen	10	WestIndies	Floyd Reifer	Cricket West Indies
143	Shannon Gabriel	10	WestIndies	Floyd Reifer	Cricket West Indies
144	Shimron Hetmyer	10	WestIndies	Floyd Reifer	Cricket West Indies
145	Shai Hope	10	WestIndies	Floyd Reifer	Cricket West Indies
146	Evin Lewis	10	WestIndies	Floyd Reifer	Cricket West Indies
147	Ashley Nurse	10	WestIndies	Floyd Reifer	Cricket West Indies
148	Nicholas Pooran (wk)	10	WestIndies	Floyd Reifer	Cricket West Indies
149	Kemar Roach	10	WestIndies	Floyd Reifer	Cricket West Indies
150	Andre Russell	10	WestIndies	Floyd Reifer	Cricket West Indies
151	Oshane Thomas	10	WestIndies	Floyd Reifer	Cricket West Indies

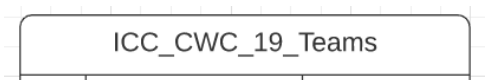
152 rows × 5 columns

Physical Schema

In [4]:

```
from IPython.display import Image
Image("D:/Northeastern University/Data Management & Database Design/Assignment
2/Chandramouli_Rohit Prasanna_INFO 6210_Assignment2/Diagram 1.png", width = 300)
```

Out[4]:



PK	Team_ID	Integer
	Player_Name	varchar(40)
	Team_Name	Varchar(40)
	Coach_name	Varchar(80)
	Board_Name	Varchar(80)

ICC_CWC_19_Teams being our main Databse and Team_ID being the primary key, we see alot of redundancy in the primary key which should not be the case so as to avoid editing discrepancies in the Database. To avoid such issues, we need to normalise the database into 1NF, 2NF and then eventually to 3NF.

NORMALIZATION

1NF

First normal form (1NF) is a property of a relation in a relational database. A relation is in first normal form if and only if the domain of each attribute contains only atomic (indivisible) values, and the value of each attribute contains only a single value from that domain. Also, primary keys should be uniquely identified.

To perform 1NF on out database, we seperated players information and created a differenct tables for players and its corresponding information as ICC_CWC_19_Players, independant of the ICC_CWC_19_Teams table.

In [5]:

```
ICC_CWC_19_Teams= pd.read_csv('D:/Northeastern University/Data Management & Database Design/Assignment 2/Chandramouli_Rohit Prasanna_INFO 6210_Assignment2/ICC_CWC_19_Teams1.csv')
ICC_CWC_19_Teams
```

Out[5]:

	Team_ID	Team_Name	Matches	Wins	Losses	Board_Name	Coach_Name
0	T1	India	10	7	2	Board of Control for Cricket in India	Ravi Shastri
1	T2	Australia	10	7	3	Cricket Australia	Justin Langer
2	T3	England	10	7	3	England and Wales Cricket Board	Trevor Bayliss
3	T4	New Zealand	10	6	3	New Zealand Cricket	Gary Stead
4	T5	Pakistan	8	5	3	Pakistan Cricket Board	Mickey Arthur
5	T6	Sri Lanka	8	3	4	Sri Lanka Cricket	Chandika Hathurusingha
6	T7	South Africa	9	3	5	Cricket South Africa	Ottis Gibson
7	T8	Bangladesh	9	3	5	Bangladesh Cricket Board	Steve Rhodes
8	T9	West Indies	9	2	6	Cricket West Indies	Floyd Reifer
9	T10	Afghanistan	9	0	9	Afghanistan Cricket Board	Phil Simmons

In [6]:

```
ICC_CWC_19_Players= pd.read_csv('D:/Northeastern University/Data Management & Database Design/Assignment 2/Chandramouli_Rohit Prasanna_INFO 6210_Assignment2/ICC_CWC_19_Players.csv')
ICC_CWC_19_Players
```

Out[6]:

	Player_Name	Player_Id	Team_Id
0	Gulbadin Naib (c)	1	T10
1	Rashid Khan (vc)	2	T10
2	Aftab Alam	3	T10
3	Asghar Afghan	4	T10

	Player_Name	Player_Id	Team_Id
4	Dawlat Zadran	5	T10
...	...	...	...
147	Ashley Nurse	148	T9
148	Nicholas Pooran (wk)	149	T9
149	Kemar Roach	150	T9
150	Andre Russell	151	T9
151	Oshane Thomas	152	T9

152 rows × 3 columns

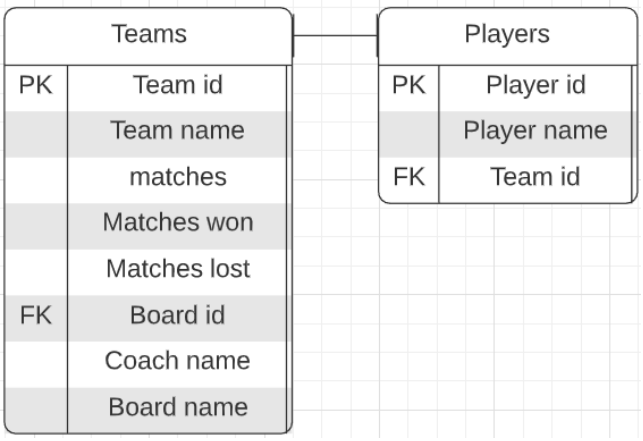
Team_ID being a primary key(PK) to ICC_CWC_19_Teams and being a foreign key(FK) to ICC_CWC_19_Players. Player_ID being a primary key(PK) to ICC_CWC_19_Players. Hence for both the tabels, we see the primary keys are uniquely identifying the respective tables.

Conceptual Model

In [7]:

```
Image("D:/Northeastern University/Data Management & Database Design/Assignment
2/Chandramouli_Rohit Prasanna_INFO 6210_Assignment2/Diagram 2.png", width = 400)
```

Out[7]:

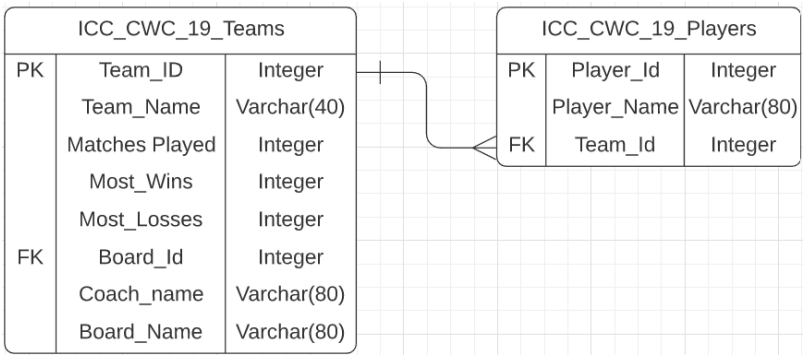


Physical schema

In [8]:

```
Image("D:/Northeastern University/Data Management & Database Design/Assignment
2/Chandramouli_Rohit Prasanna_INFO 6210_Assignment2/Diagram 3.png", width = 500)
```

Out[8]:



2NF

A relation is in the second normal form if it satisfies following two criterias:

1. All requirements for 1st NF must be met.
2. No partial dependencies.

As we see the tables above, they are already in 1NF and also we find no partial dependancies in any of the attributes. Hence we conclude that they are in 2nd Normal Form already.

3NF

A relation is called to be in a 3rd Normal Form if all the following criterias are satisfied:

1. All requirements for 2nd NF must be met.
2. Eliminate fields that do not directly depend on the primary key; that is no transitive dependencies.

In ICC_CWC_19_Teams, we have a transitive dependanciy in the table. We see that Coach_name is dependant on Board_name and Board_name is dependant on Team_ID, this creates a transitive dependancy. Hence to eliminate transitive dependancies, we created an independant tabel for baords i.e., ICC_CWC_19_Board.

Hence we have three different datasets connected in a database so as to make it normalised to the 3rd normal form.

In [9]:

```
ICC_CWC_19_Teams= pd.read_csv('D:/Northeastern University/Data Management & Database
Design/Assignment 2/Chandramouli_Rohit Prasanna_INFO 6210_Assignment2/ICC_CWC_19_Teams2.csv')
ICC_CWC_19_Teams
```

Out[9]:

	Team_ID	Team_name	Matches	Wins	Losses	Board_Id
0	T1	India	10	7	2	B1
1	T2	Australia	10	7	3	B2
2	T3	England	10	7	3	B3
3	T4	New Zealand	10	6	3	B4
4	T5	Pakistan	8	5	3	B5
5	T6	Sri Lanka	8	3	4	B6
6	T7	South Africa	9	3	5	B7
7	T8	Bangladesh	9	3	5	B8
8	T9	West Indies	9	2	6	B9
9	T10	Afghanistan	9	0	9	B10

In [25]:

```
ICC_CWC_19_Teams.isnull().sum()
```

Out[25]:

```
Team_ID      0
Team_name    0
Matches      0
Wins         0
Losses       0
Board_Id     0
dtype: int64
```

In [26]:

```
ICC_CWC_19_Teams.duplicated(['Team_ID'])
```

Out[26]:

```
0    False
```

```
1     False
2     False
3     False
4     False
5     False
6     False
7     False
8     False
9     False
dtype: bool
```

In [27]:

```
ICC_CWC_19_Players= pd.read_csv('D:/Northeastern University/Data Management & Database Design/Assignment 2/Chandramouli_Rohit Prasanna_INFO 6210_Assignment2/ICC_CWC_19_Players.csv')
ICC_CWC_19_Players
```

Out[27]:

	Player_Name	Player_Id	Team_Id
0	Gulbadin Naib (c)	1	T10
1	Rashid Khan (vc)	2	T10
2	Aftab Alam	3	T10
3	Asghar Afghan	4	T10
4	Dawlat Zadran	5	T10
...	...	...	...
147	Ashley Nurse	148	T9
148	Nicholas Pooran (wk)	149	T9
149	Kemar Roach	150	T9
150	Andre Russell	151	T9
151	Oshane Thomas	152	T9

152 rows × 3 columns

In [28]:

```
ICC_CWC_19_Players.isnull().sum()
```

Out[28]:

```
Player_Name    0
Player_Id      0
Team_Id        0
dtype: int64
```

In [29]:

```
ICC_CWC_19_Players.duplicated(['Player_Id'])
```

Out[29]:

```
0      False
1      False
2      False
3      False
4      False
       ...
147    False
148    False
149    False
150    False
151    False
Length: 152, dtype: bool
```

In [30]:

```
ICC_CWC_19_Board= pd.read_csv('D:/Northeastern University/Data Management & Database Design/Assignment 2/Chandramouli_Rohit Prasanna_INFO 6210_Assignment2/ICC_CWC_19_Boards.csv')
ICC_CWC_19_Board
```

Out[30]:

	Board_Id	Board Name	Coach Name
0	B1	Board of Control for Cricket in India	Ravi Shastri
1	B2	Cricket Australia	Justin Langer
2	B3	England and Wales Cricket Board	Trevor Bayliss
3	B4	New Zealand Cricket	Gary Stead
4	B5	Pakistan Cricket Board	Mickey Arthur
5	B6	Sri Lanka Cricket	Chandika Hathurusingha
6	B7	Cricket South Africa	Ottis Gibson
7	B8	Bangladesh Cricket Board	Steve Rhodes
8	B9	Cricket West Indies	Floyd Reifer
9	B10	Afghanistan Cricket Board	Phil Simmons

In [21]:

```
ICC_CWC_19_Board.isnull().sum()
```

Out[21]:

```
Board_Id      0
Board Name    0
Coach Name    0
dtype: int64
```

In [22]:

```
ICC_CWC_19_Board.duplicated(['Board_Id'])
```

Out[22]:

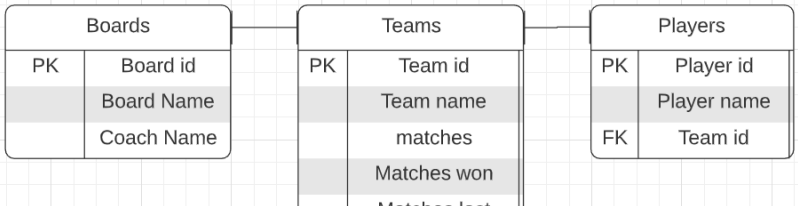
```
0    False
1    False
2    False
3    False
4    False
5    False
6    False
7    False
8    False
9    False
dtype: bool
```

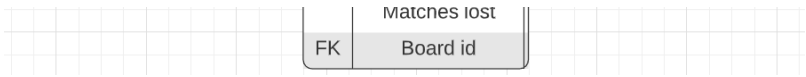
CONCEPTUAL MODEL

In [12]:

```
Image("D:/Northeastern University/Data Management & Database Design/Assignment 2/Chandramouli_Rohit Prasanna_INFO 6210_Assignment2/Diagram 4.png", width = 500)
```

Out[12]:



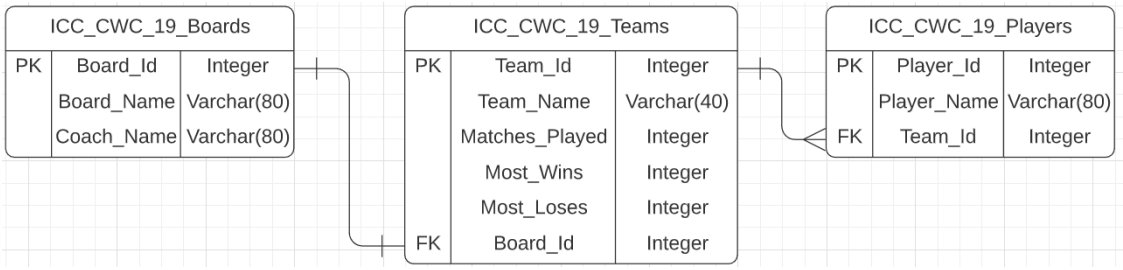


PHYSICAL SCHEMA

In [13]:

```
Image("D:/Northeastern University/Data Management & Database Design/Assignment
2/Chandramouli_Rohit Prasanna_INFO 6210_Assignment2/Diagram 5.png", width = 700)
```

Out[13]:

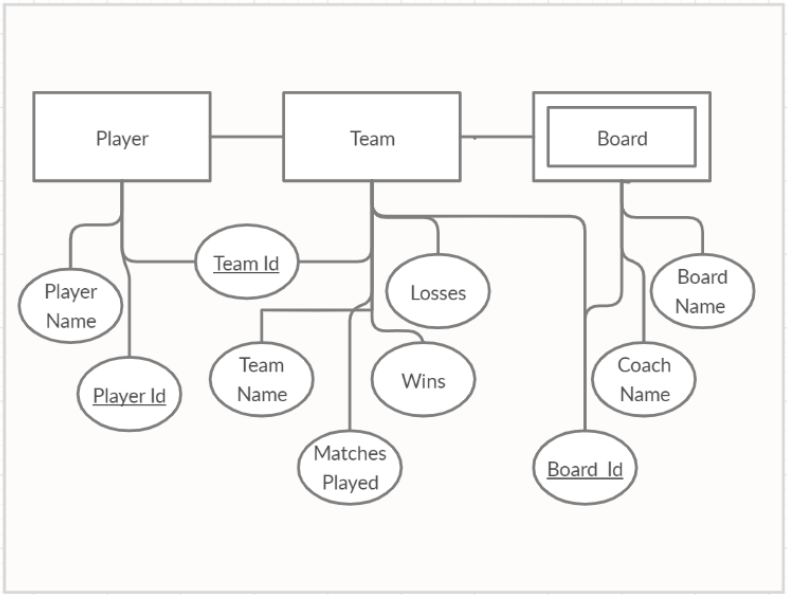


UML Diagram

In [24]:

```
Image("D:/Northeastern University/Data Management & Database Design/Assignment
2/Chandramouli_Rohit Prasanna_INFO 6210_Assignment2/UML.png", width = 500)
```

Out[24]:



Strong Entity is represented by a single rectangle While the Weak Entity is represented by Double lined rectangle.

1. What are the ranges, data types and format of all the attributes in your entities?

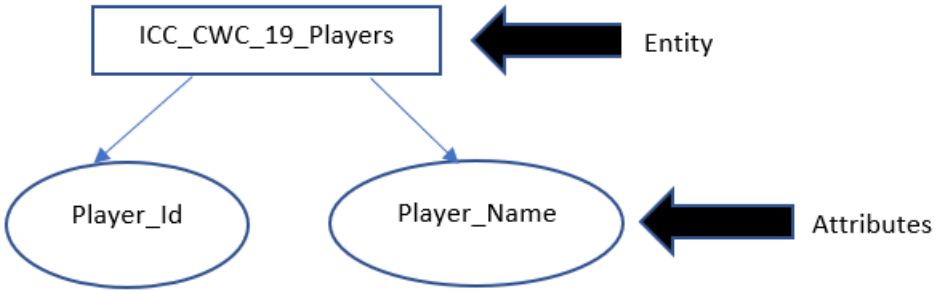
The ranges, data types and format of all the attributes in our entities are mentioned below:

VARCHAR (40)	INTEGER
Player_Name	Board_Id
Team_Name	Team_Id

Coach_name	Matches_Played
Board_Name	Wins
	Losses
	Player_Id

2. When should you use an entity versus attribute?

Entity is a real-world object that represents data in database while an attribute is a property that describes an entity. To understand what information, we are storing inside an entity, we use attributes to specify the data types, ranges and format and its combinations



3. When should you use an entity or relationship, and placement of attributes?

We use this when the tables in the databases are dependent on each other. Relationship between entities is a kind of a mathematical relationship taken from entity sets.

From our ER diagram, we can see one such example:

(Board_Name, Coach_Name) ∈ Team (Table)

4. How did you choose your keys? Which are unique?

We have chosen the below keys as the unique keys:

Team_Id: Primary Key (Because it is the only unique common key in all the tables and as per the relationship requirements and criteria based on which we are going to query the use cases)

Board_Id: Foreign Key (A primary key in one table becomes a foreign key in another table. It is used to link and create relationship with another table for reference and data)

5. Did you model hierarchies using the “ISA” design element? Why or why not?

No, we did not use “ISA” design element while modelling the ER diagram as the entities were not dependent. And also there was no scope that the hierarchy has an inheritance followed

6. Were there design alternatives? What are their tradeoffs: entity vs. attribute, entity vs. relationship, binary vs. ternary relationship?

Yes, there can be design alternatives in our ER diagram. We have used Binary VS. Ternary relationship i.e their arrangement is shown when two or three entities participate in the design.

7. Where are you going to find the real-world data to populate your model?

We have used the below real-world website to gather the data

https://www.t20worldcup.com

AUDIT VALIDITY/ACCURACY

The acquired data is said to be valid when it doesn't contain any null values. Using Python, we checked for null values and duplicate values in the data. All the rows were selected from all 3 sources and was found to have no null values.

AUDIT COMPLETNESS

The data collected were obtained from genuine websites and are real world data. The data is said to be complete when the obtained result matches the real time data. The final data which we have obtained correlates with ICC world raking, and hence proves to be complete

AUDIT CONSISTENCY/UNIFORMITY

The data is consistent with no null values. The data collected from 3 different sources are linked through by a common attribute.

CONCLUSION

Primary focus of this assignment is to normalize dataset used in the previous assignment, cleaning of data, checking null values present in the data, data munging and to reformat the data to fit a conceptual database model.

CONTRIBUTION

Your contribution towards project. How much code did you write and how much you took from other site or some other source.

I contributed By Own: 50%

By External source: 40%

Provided by the professor : 10%

Citations and References:

Each code in this assignment is self-developed and is not copied from any website.

References were taken from the below website

https://www.cricketworldcup.com/

https://stackoverflow.com/

https://www.w3schools.com/sql

https://www.lucidchart.com

https://app.creately.com/

https://www.smartdraw.com

https://www.t20worldcup.com/

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