

MRO Facility MTrak System

**Phase II – Implementation of Database Application in MS Access
IEM 5723 - DATA, PROCESS, AND OBJECT MODELING**



Heartful thanks to Dr. Kamath for assisting us

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EXECUTIVE SUMMARY

Our second phase of the project started by constructing an entity relationship (ER) diagram. The project requirement also was to normalize the ER model via 1st normal form (1NF), 2NF and 3NF respectively. The entity relationship model was designed by the information provided in sample records, used cases and domain model constructed in the first phase. For the ER diagram, we used crow's foot and IDEF1x notation. Starting with the context-based model, the level of details increased in the form of association and other attributes in key based model and fully attributed model. The ER diagram can be found in figure 1, 2, 3, 4, 5 and 6. In the next section, we described the datatypes for each attribute of the entity. This can be found in Section 2 of the report. Furthermore, the normalization of our ER model needed to be checked. After checking the conditions of 1NF, 2NF and 3NF, we concluded that the normalization for our ER model was not needed as our fully attributed model developed was already in the 3rd normal form.

The next phase of our project was developing live and working MTrak system application by use of queries, forms and switchboard in MS-Access. Firstly, sample records were used to create tables for different entities in MS-Access. After the creation of table, relationships were established for the entities considering the ER diagram from the first part. After generating the relationship via relationship table, some of the queries were developed. The list of queries written are listed below.

- Details of parts for a particular end item
- List of activities on part in a specified timeframe
- Number of end items in particular department
- Number of parts for a particular end item
- Present how many parts are in-process for a particular repair shop
- List of activities on a particular part
- List of parts in particular facility

Moving on to the next section of developing the database application, we created forms for each entity namely Activity, Activity_End_Item, Activity_Part, Customer, Department, End_Item, Facility and Part. Each form can be found in the database application to input the data required for the users. In addition to forms, we generated some reports which are listed as below.

- Details of all items which has been delivered after due date
- List of items that are repaired till date
- List of activities carried on respective end item
- List of activities carried on respective part
- List of activities on a particular part
- List of activities on part which are completed within 1 week
- List of defective parts which have been repaired
- List of items that are repaired till date
- Number of parts in storage

After generating reports, switchboard was developed to toggle between different fields. The detailed description of how to use switchboard for users is described in the "User Guide".

1. ENTITY AND RELATIONSHIP

For the entity and relationship diagram, we started off with context-based model and increasing the level of detail in key based model and fully attributed model. In context model, there were simply entities and simple relation between entities without the associative entities for many to many relationships. The next model we constructed was key based model where we assigned primary keys for unique identifier and associative entities for many to many relationships. Associative entity combines the many to many relationships such that the associative entity is on many sides of the relationship and entity combining area in one side forming a one to many relationships. The entity is represented in square box whereas associative entity is represented in oval boxes. This representation is important because it helps us to differentiate between the entities. Moving on to next model was fully attributed model where all the attributes were listed in the entities alongside the primary keys. We used two types of identification for building the ER diagram namely Crow's foot notation and IDEF1x notation which are explained in their respective section.

a) Crow's foot notation

The context-based model, key based model and fully attributed model are shown as below with correct Crow's foot notation.

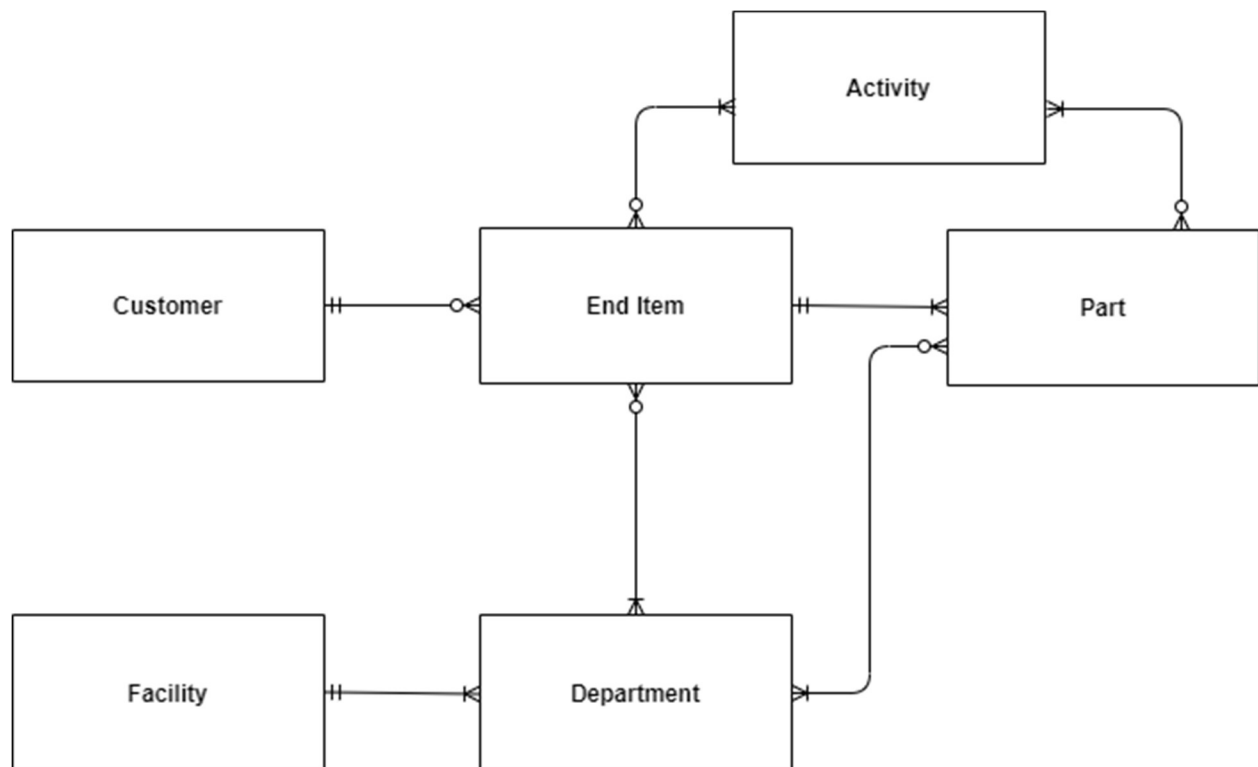


Figure 1: Context based model-Crow's foot notation

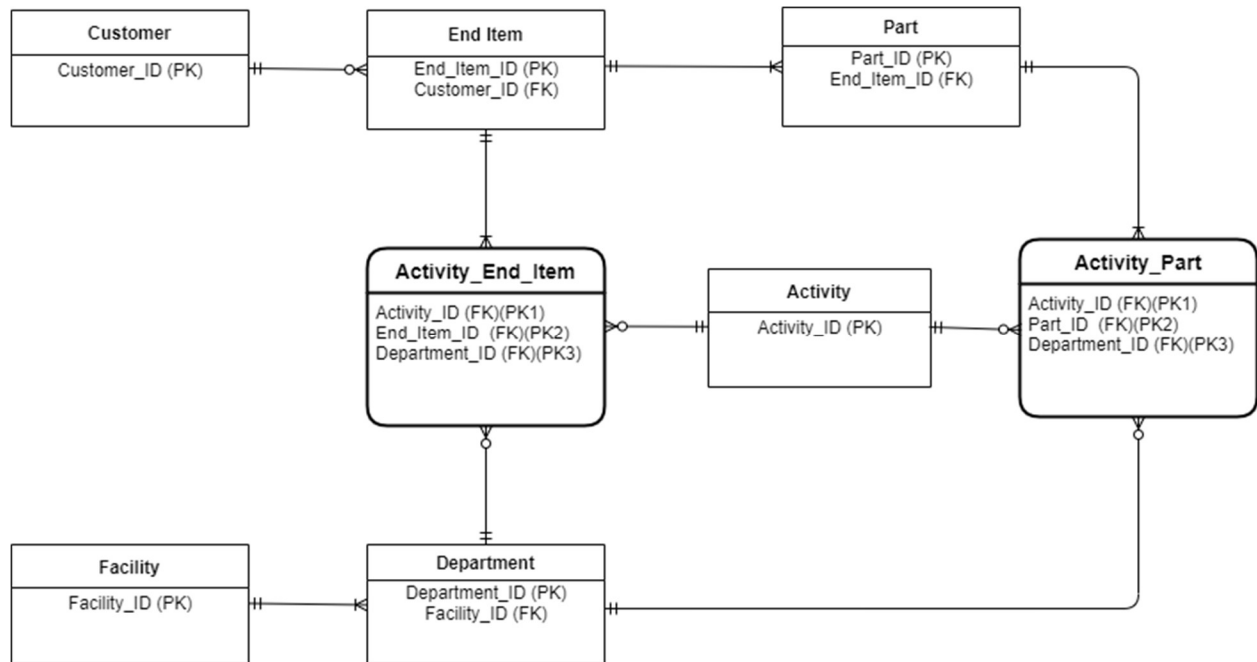


Figure 2: Key based model- Crow's foot notation

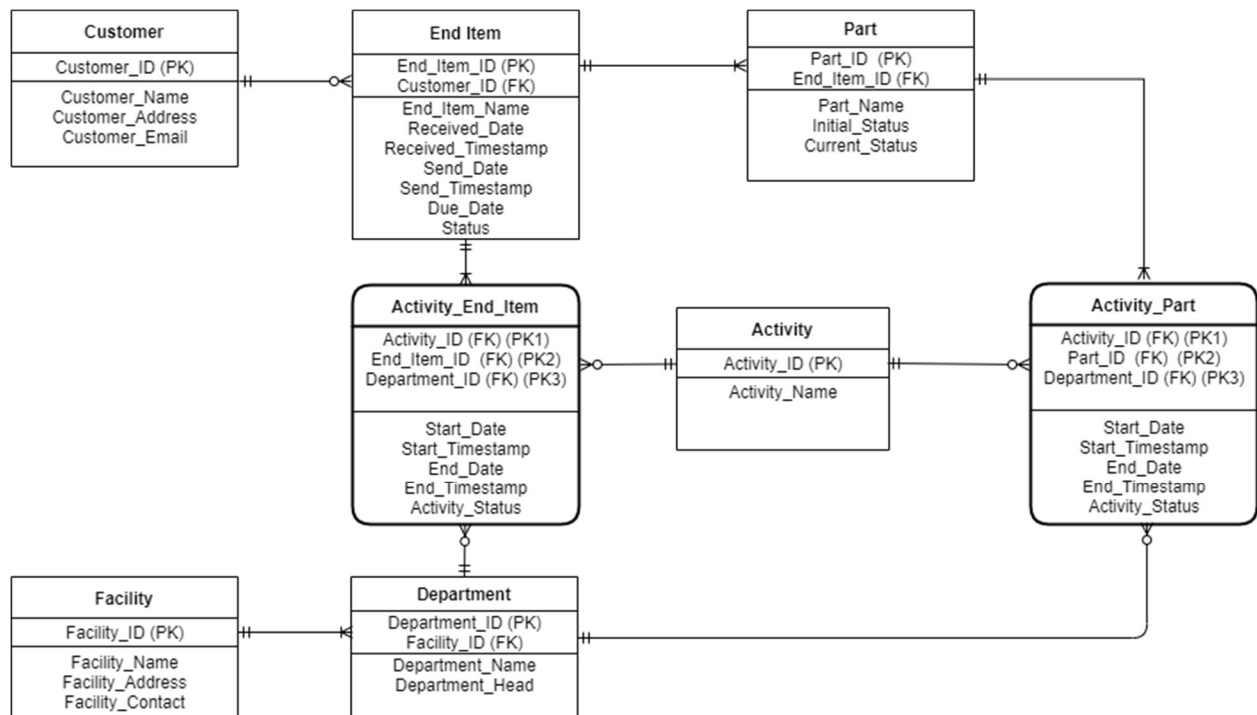


Figure 3: Fully attributed model-Crow's foot notation

b) IDEF1x notation:

For this notation, one of the key things is the differentiation of non-identifying relationship and identifying relationship. Non-identifying relationship can be defined as if the instance of child entity can be uniquely identified without knowing the associated instance of the parent entity. In contradiction, opposite is true for the identifying relationship. The context-based model, key based model and fully attributed model are shown as below with correct IDEF1x notations.

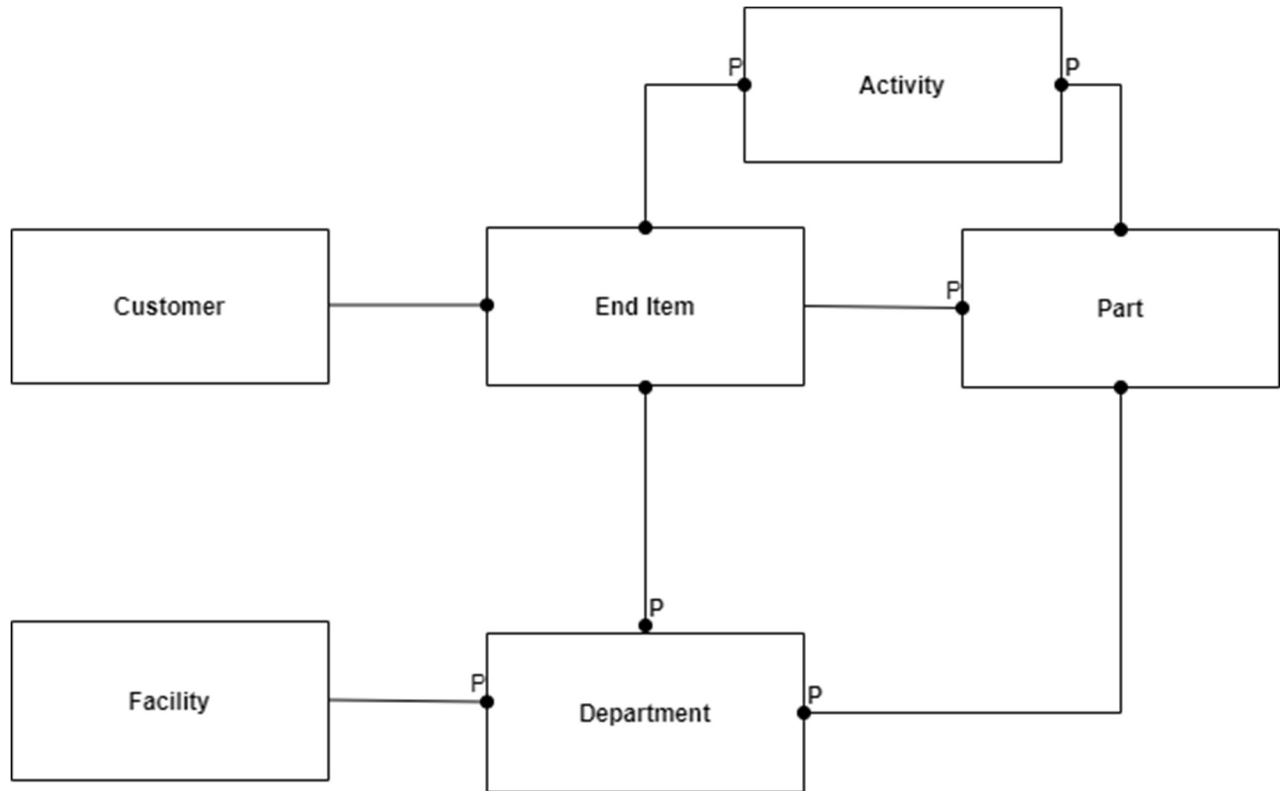


Figure 4: Context based model-IDEF1x notation

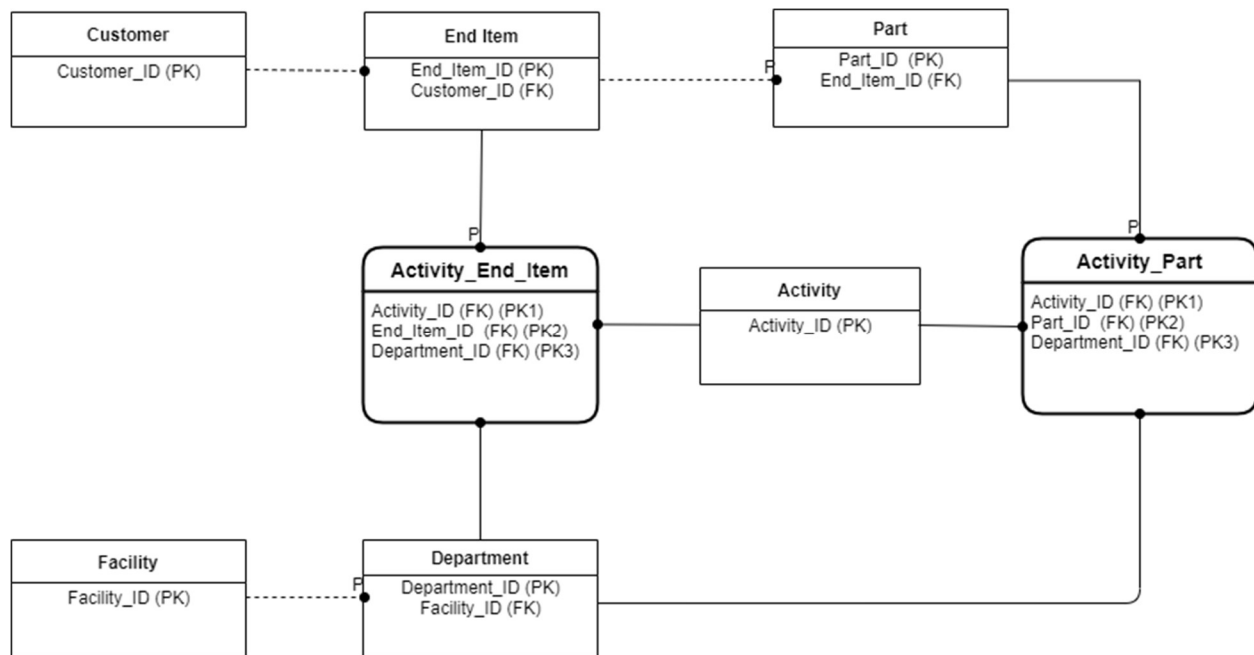


Fig 5: Key based model-IDEF1x notation

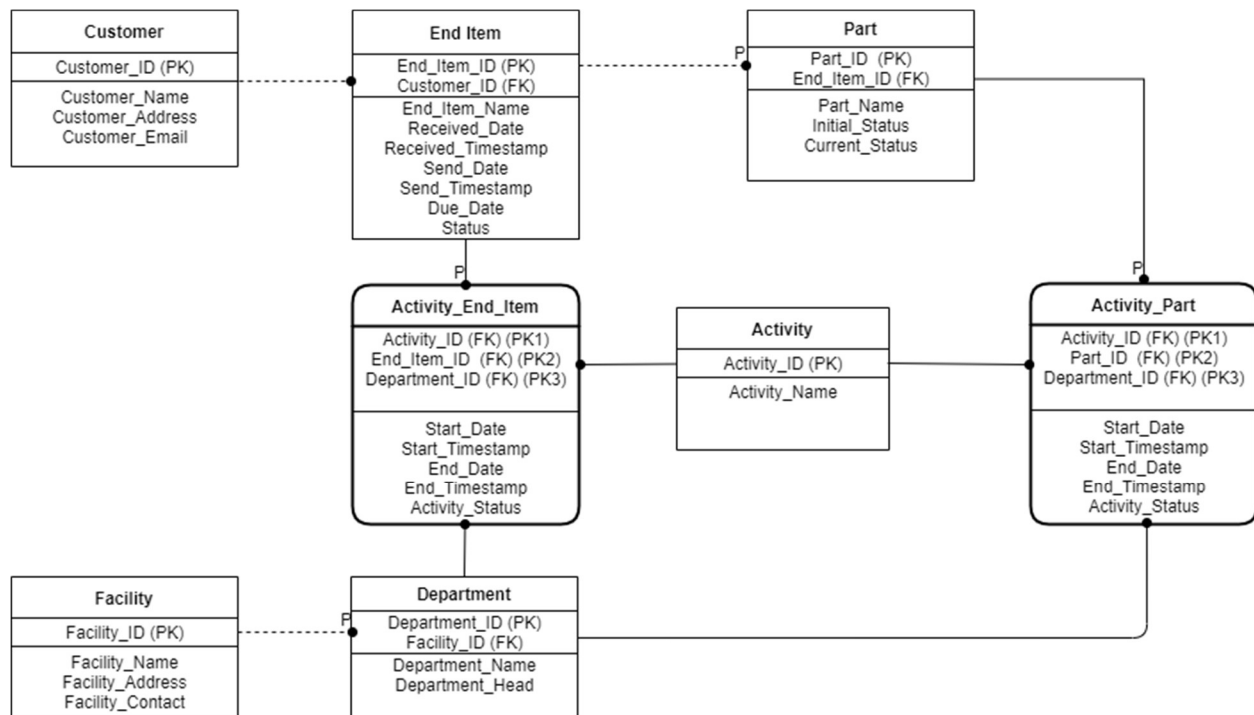


Figure 6: Fully attributed model- IDEF1x notation

2. DATA DESCRIPTION AND TYPES

S.No.	Entity	Attributes	Description	Data type
1.	Customer	Customer_ID	Unique identity of customer	Text
		Customer_Name	First and last name of customer	Text
		Customer_Address	Physical address of customer	Text
		Customer_Email	Customer contact in form of Email.	Hyperlink
2.	End Item	End_Item_ID (PK)	Unique identity of customer end item	Text
		Customer_ID (FK)	Identity of customer from customer entity	Text
		End_Item_Name	Name of customer end item	Text
		Received_Date	Date when end item was received	Date/Time
		Received_Timestamp	Time when end item was received	Date/Time
		Send_Date	Date when the end item was sent	Date/Time
		Send_Timestamp	Time when end item was sent	Date/Time
		Due_Date	Date when end item is repaired and shipped to customer	Date/Time
3.	Part	Status	Status of end item	Text
		Part_ID (PK)	Unique identity of parts of end item	Text
		End_Item_ID (FK)	Identity of end item from end item entity	Text
		Part_Name	Name of part of end item	Text
		Initial_Status	Original status of specific part	Text
4.	Activity	Current_Status	Current status of part	Text
		Activity_ID (PK)	Unique identity of the activity involved	Text
		Activity_Name	Name of the activity	Text
5.	Facility	Facility_ID (PK)	Unique identity of facility	Text
		Facility_Name	Name of the facility	Text
		Facility_Address	Physical address of the facility	Text
		Facility_Contact	Contact number of the facility	Text
6.	Department	Department_ID (PK)	Unique identity of the department	Text
		Facility_ID (FK)	Identity of facility from facility entity	Text
		Department_Name	Name of the department	Text
		Department_Head	Name of department head	Text
7.	Activity_End_Item	Activity_ID (FK) (PK1)	Unique identity of activity from activity entity	Text
		End_Item_ID (FK) (PK2)	Identity of end item from end item entity	Text
		Department_ID (FK) (PK3)	Identity of department from department entity	Text
		Start_Date	Start date of the specific activity for an end item	Date/Time
		Start_Timestamp	Start time of the specific activity for an end item	Date/Time
		End_Date	End date of the specific activity for an end item	Date/Time
		End_Timestamp	End time of the specific activity or an end item	Date/Time

		Activity_Status	Status of the specific activity for an end item	Text
8.	Activty_Part	Activity_ID (FK) (PK1)	Unique identity of activity from activity entity	Text
		Part_ID (FK) (PK2)	Identity of end item from end item entity	Text
		Department_ID (FK) (PK3)	Identity of department from department entity	Text
		Start_Date	Start date of the specific activity for a part	Date/Time
		Start_Timestamp	Start time of the specific activity for a part	Date/Time
		End_Date	End date of the specific activity for a part	Date/Time
		End_Timestamp	End time of the specific activity for a part	Date/Time
		Activity_Status	Status of the specific activity for a part	Text

3. CHECK FOR NORMALIZATION

In the data model created for first time, we checked for 1NF rule compatibility and we found our model compatible. Then, we checked functional dependency rule to check validity of data model with respect to 2NF rule. Then after, we checked transitive dependency in each entity to very 3NF claim and divided entities into sub entities to make our data model compatible with 3NF rule. (Activity table further got classified into Activity_End_Item, Activity_Part). Fully attributed model shown above is fully normalized data model compatible with 1NF, 2NF and 3NF rules. The finalized normal entity relationship diagram can be found in MS-Access database application> Database Tools> Relationships tab.

REFERENCES

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