Lab 01- Creating your first Data Models

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Lab 01- Creating your first Data Models

In this section we will go through different modeling scenarios to strengthen our skill in:

1) Identifying entities, attributes, and relationship types in a series of business rules and requirements.
2) Model the identified entities, attributes, and relationships within a modeling tool (like draw.io).

A. Developing a model for a Piano Manufacturer's database (Problem 5 in our Exercise Sheet):

> Ebony and Ivory, a piano manufacturer, wants to keep track of each piano it makes. To achieve this, each piano is uniquely identified by a serial number and its manufacturing completion date. Each Piano is an instance of a specific model, and each model is uniquely distinguished by an identification number and a designated name.
>
> To develop each Piano model, Ebony and Ivory relies on multiple piano designers, each of which may participate in the development of one or multiple pianos as their tenure progresses. It is crucial for Ebony and Ivory to keep track of the designers responsible for these models even if no attributes have been identified yet. Finally, not every model developed reach the manufacturing phase, and for a piano to be manufactured the model must have been approved first.

Please draw a model of the needed database including the inferences made above (entities, attributes, and relationships).

To model the database for the Piano Manufacturer based on the provided requirements, we have identified the entities, attributes, and relationships involved. Below is how its represented:

Entities: Piano, Model, Designer

Attributes:

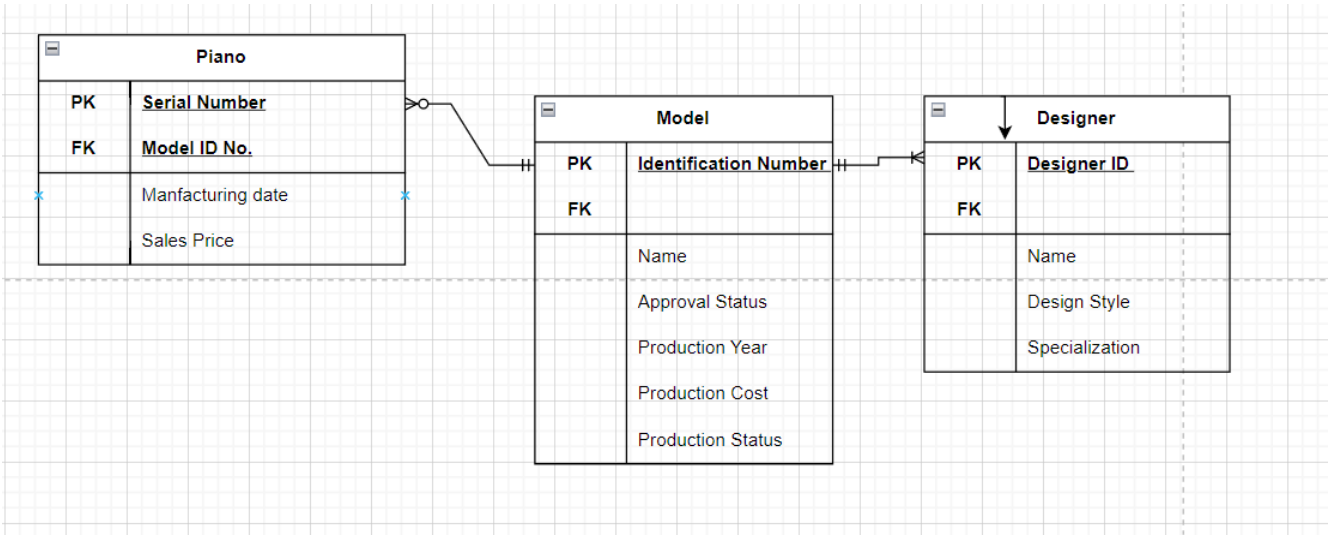
- *Piano*: Serial Number (Primary Key), Manufacturing Date, Model ID No. (Foreign Key), Sales Price
- Model: Identification Number (Primary Key), Name, Approval Status, Production Year, Production Cost, Production Status

- Designer: Designer ID (Primary Key), Name

Relationships:

- A Piano is an instance of a specific Model.
- Each Model can have multiple Designers involved in its development.
- To be manufactured, a Model must be approved.

Based on these entities, attributes, and relationships, Ebony and Ivory can effectively keep track of each piano it manufactures, the models used, and the designers involved in the development process. This structured database design will help Ebony and Ivory manage their operations efficiently and maintain accurate records.



B. Expanding our model for the Piano Manufacturer's database (Problem 6 in our Exercise Sheet):

Continuing with our modeling of the Piano Manufacturer's database, we learn that:

> Ebony and Ivory (see (problem 5) above) employ piano technicians who are responsible for inspecting each piano before shipments are sent to the customers. Each piano must be go through at least 2 inspections which are carried out by technicians (who are themselves identified by their employee number). For each separate inspection, the company needs to record its date and a quality evaluation grade.

Additional Entities & Attribute:

4. Inspection:

- Inspection ID (Primary Key)
- Inspection Date
- Quality Evaluation Grade

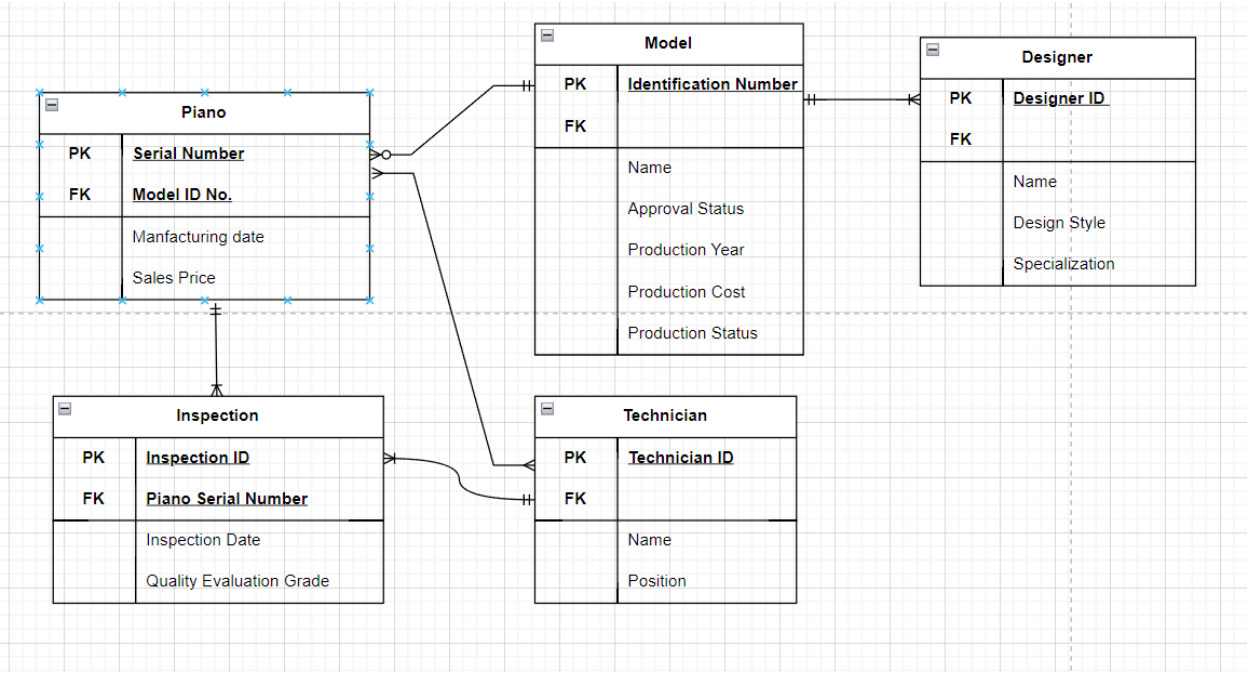
5. Technician:

- Technician ID (Primary Key)
- Name
- Position

Relationships:

- Piano-Technician (Many-to-Many):
    - A Piano undergoes inspections carried out by Technicians.
    - A Technician can inspect multiple Pianos.
    - A Piano must go through at least 2 inspections.
- Inspection-Piano (One-to-Many):
    - An Inspection is carried out on a Piano.
    - A Piano can have multiple Inspections.

Please draw a model of the needed database including the inferences made above (entities, attributes, and relationships).



C. Finalizing our model for the Piano Manufacturer's database (Problem 7 in our Exercise Sheet):

As we present our proposal to the board of "Ebony and Ivory", we are informed that there are additional considerations needed for the database. Specifically, we learn that:

The piano technicians (see (problem 6) above) have a hierarchy of reporting relationships: *some* technicians have supervisory responsibilities in addition to their inspection role and have at least one but potentially multiple other technicians report to them. The supervisor technicians themselves report to the chief technician of the company who has no supervisors above.

Please answer the following questions to add the final touches to the database model:

1. Please draw a model of the needed database including the inferences made above (entities, attributes, and relationships).
2. Take the models built for the last three problems (the models made for "Ebony & Ivory") and combine them so that we can present the full database model to the Board of the company. Please add your full model below:

Ans: To finalize the database model for Ebony and Ivory's piano manufacturing database, including the additional considerations regarding the hierarchy of reporting relationships for piano technicians, we need to integrate the previous models. Here's the combined model:

Entities: Piano, Model, Designer, Inspection, Technician, Technician-Supervisor, Chief Technician

Additional Attributes:

- Supervisor Technician ID (Foreign Key, references Technician ID)
- Chief Technician (Boolean attribute indicating if the technician is the chief technician)

Relationships:

Piano-Model (Many-to-One):

- Each Piano is an instance of a specific Model.
- Each Model can have multiple Pianos.

Model-Designer (Many-to-Many):

- Multiple Designers contribute to the development of each Model.
- Each Designer may contribute to one or multiple Models.

Model-Approval (One-to-One or Many-to-One):

- Each Model must be approved before manufacturing.
- Not every Model developed reaches the manufacturing phase.

Piano-Technician (Many-to-Many):

- A Piano undergoes inspections carried out by Technicians.
- A Technician can inspect multiple Pianos.
- A Piano must go through at least 2 inspections.

Inspection-Piano (One-to-Many):

- An Inspection is carried out on a Piano.
- A Piano can have multiple Inspections.

Technician-Supervisor (One-to-Many):

- Technicians have supervisory responsibilities.
- Supervisor Technicians have one or multiple Technicians reporting to them.

Chief Technician (One-to-one)

- Supervisor Technicians report to the Chief Technician.