ENSF 608 Project

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**Conceptual Database Design**



Design Explanation

From the software requirement, we identified four entities: TOOL, SUPPLIER, ORDER, and CLIENT. TOOL is identified by its key attribute ID, it also has simple attributes including Type, Name, Qty\_in\_stock, and Price. TOOL can be furthered grouped into ELECTRICAL\_TOOL and NON\_ELECTRICAL\_TOOL for an attribute-defined specialization (based on Type). This is a total disjoint specialization. ELECTRICAL\_TOOL and NON\_ELECTRICAL\_TOOL inherits the attributes from TOOL; ELECTRICAL\_TOOL also have a local attribute Power\_type.

SUPPLIER is identified by its key attribute ID, as well as simple attributes Type, Name, Address, and Sale\_contact. SUPPLIER can be further grouped into LOCAL\_SUPPLIER and INTERNATIONAL\_SUPPLIER for an attribute-defined specialization (based on Type). This is a total disjoint specialization. LOCAL\_SUPPLIER and INTERNATIONAL\_SUPPLIER inherits the attributes from SUPPLIER; INTERNATIONAL\_SUPPLIER also have a local attribute Import\_tax.

Every TOOL item is manufactured by a SUPPLIER, and a SUPPLIER can manufacture multiple TOOL items, making it a 1: N relationship between TOOL and SUPPLIER. TOOL have total participation in this relationship. SUPPLIER has partial participation as they may exist in the database because of old merchandise that the shop carries.

ORDER is identified by its key attribute ID, as well as a simple attribute Date and Is\_ordered. There is a n-ary relationship ORDERLINE between TOOL, SUPPLIER, and ORDER; it has the attribute Order\_Qty. TOOL and SUPPLIER have partial participation (only participate in the relationship if item quantity is low), but ORDER must participate in the ORDERLINE relationship (ORDER is created when restock is required). The cardinality is N:N:1 for TOOL:ORDER:SUPPLIER (there is a single SUPPLIER for each TOOL).

CLIENT is identified by its key attribute ID, as well as simple attributes First\_name, Last\_name, Address, Postal\_code, Phone\_number, and Type (Residential or Commercial). The same TOOL item can be purchased by multiple CLIENT and a CLIENT can purchase multiple TOOL items at once, making it a M:N relationship between TOOL and CLIENT. Both the CLIENT and TOOL have total participation in this relationship because CLIENT information is only saved onto the database when they make a purchase and a purchase consist of sales of at least one TOOL items. The relationship PURCHASE is identified by key attribute PO\_number (a CLIENT can purchase the same TOOL items multiple times) and simple attribute Purchase\_Qty.

**Logical Database Design**



Design Explanation

Key entity for relationship entity PURCHASE is PO\_num. While it is conventional for the key attribute to be a relationship attribute, a CLIENT can make purchase the same TOOL item on different dates, and so we need a PO\_num (purchase order number) to distinct the tuples.

We used 8A for mapping the specialization to avoid null values.