# Data and Applications
# Phase II
for
Online Shopping Services

Prepared by:
Jaiwanth Mandava
Kalyan Adithya
Vivek Pamnani

October 17, 2019

# Part I

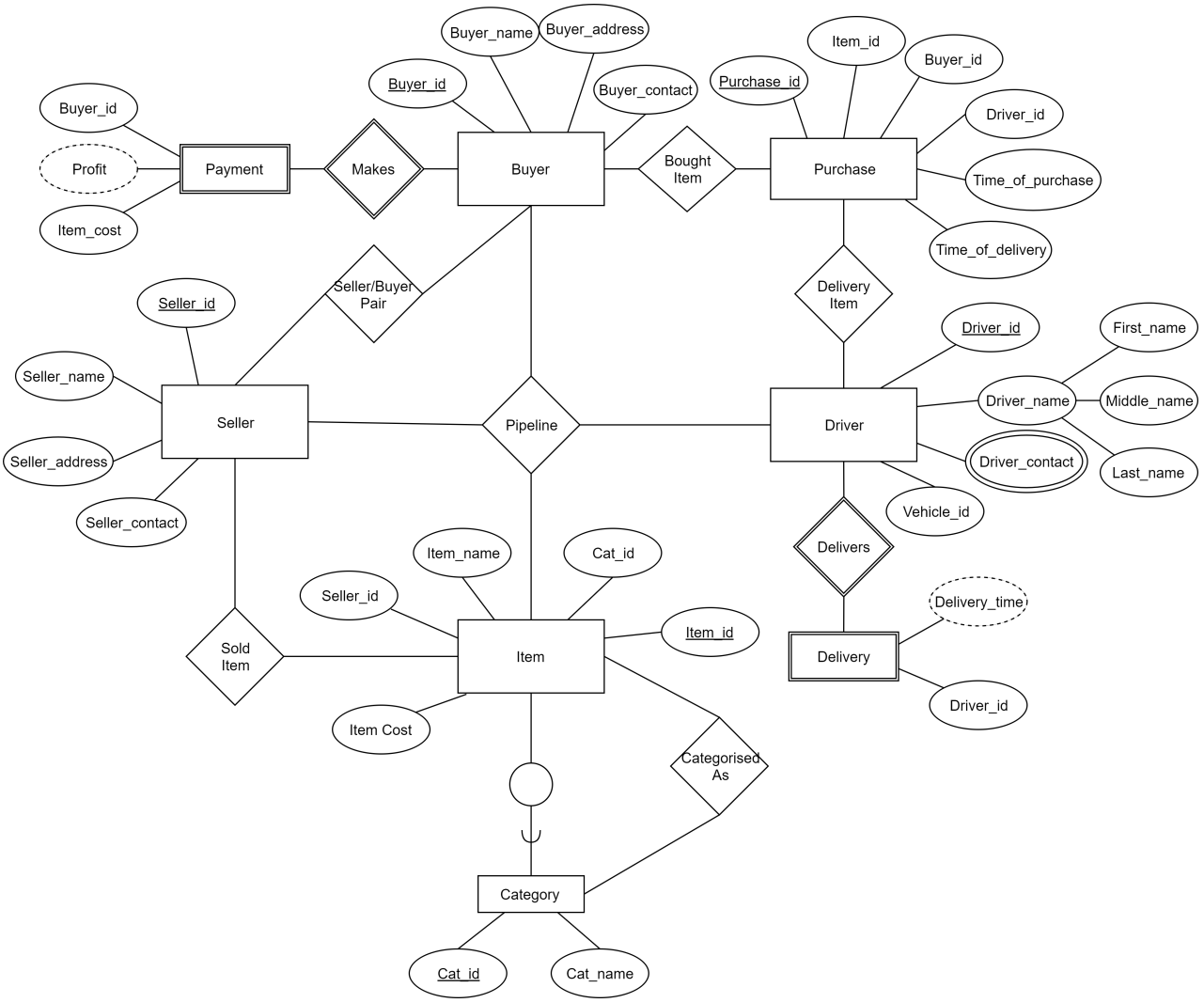


Figure 1: ER Diagram 1

Figure 1 describes the ER Diagram strictly based on the SRS document for Online Shopping Services.

Assumptions:

- 'Payment' is identified by 'Buyer' entity type type via an identifying relationship type 'Makes'.
  Reason: 'Payment' was defined as a weak entity type with foreign key 'Buyer_id' (attribute of 'Buyer') and no identifying relationship type was defined.
- 'Delivery' is identified by 'Driver' entity type type via an identifying relationship type 'Delivers'.
  Reason: 'Delivery' was defined as a weak entity type with foreign key 'Driver_id' (attribute of 'Driver') and no identifying relationship type was defined.

# Part II

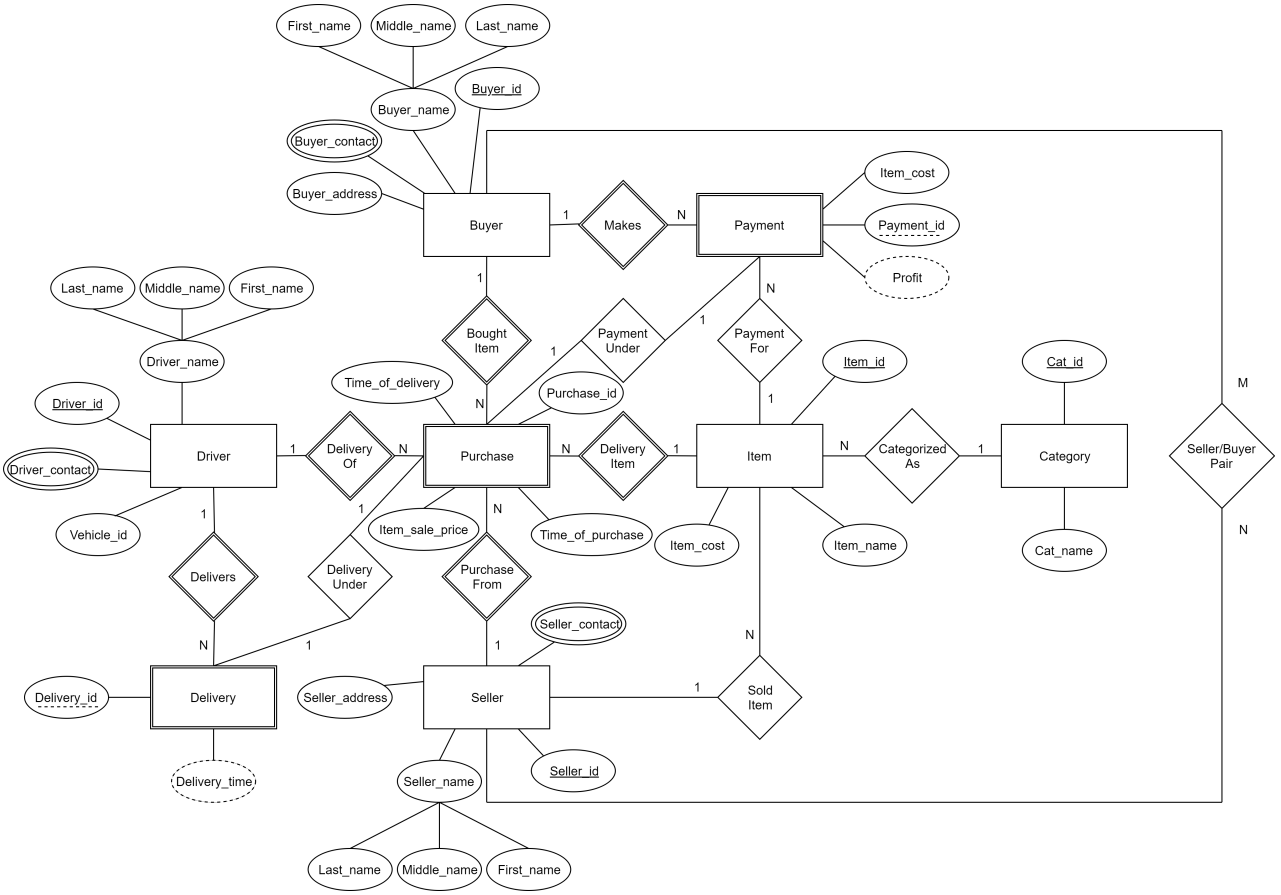


Figure 2: ER Diagram 2

Figure 2 describes the corrected ER Diagram by removing flaws and inconsistencies from the ER Diagram in the figure 1.

Flaws Corrected:

- Flaw: Weak entity types 'Payment' and 'Delivery' did not have a partial key/discriminator.
  Correction: Weak entity types 'Payment' and 'Delivery' now have 'Payment_id' and 'Delivery_id' discriminators respectively.
- Flaw: Foreign keys were included as attributes in entity types 'Payment', 'Purchase', 'Delivery', and 'Item'.
  Corrections: Removed the foreign keys as attributes and,
  - Renamed relationship type 'Delivery Of': A 1:N relationship mapping entity type 'Driver' to entity type 'Purchase'.
  - Defined relationship type 'Delivery Item': A 1:N relationship mapping entity type 'Item' to entity type 'Purchase'.
  - Defined relationship type 'Purchase From': A 1:N relationship mapping entity type 'Seller' to entity type 'Purchase'.
  - Defined identifying relationship type 'Makes': A 1:N relationship mapping entity type 'Buyer' to weak entity type 'Payment'.
  - Defined identifying relationship type 'Delivers': A 1:N relationship mapping entity type 'Driver' to weak entity type 'Delivery'.

- Flaw: Derived attributes of certain entity types were derived from attributes of unrelated entity types.
  Corrections:
  - Defined relationship type ‘Delivery Under’: A 1:1 relationship type mapping entity type ‘Delivery’ to entity type ‘Purchase’.
  - Defined relationship type ‘Payment Under’: A 1:1 relationship type mapping entity type ‘Payment’ to entity type ‘Purchase’.
  - Defined relationship type ‘Payment For’: A 1:N relationship type mapping entity type ‘Item’ and entity type ‘Payment’.
- Flaw: As a result of the above corrections, the entity type ‘Purchase’ was related to the same 4 entity types which were part of the 4-ary relationship ‘Pipeline’, hence proving the redundancy. ‘Purchase’ entity consisted of attributes vital to other derived attributes; therefore the 4-ary relationship type ‘Pipeline’ was erased and the entity type ‘Purchase’ was made a weak entity type for replacing the 4-ary relationship(refer to figure 3 on page 3). [1]
- Flaw: Entity type ‘Item’ had a subclass ‘Category’ which is not consistent with their definitions/attributes. Moreover, there existed a relationship type ‘Categorized As’ mapping ‘Item’ to ‘Category’, which is not consistent with the definition of an IS_A relationship. For example, ‘Item’ could have had subclasses ‘Ice-cream’, ‘Food’, ‘Clothing’, ‘Electronics’, etc., but not ‘Category’.
  Correction: The IS_A relationship was erased and ‘Category’ was made a strong entity which was fitting the relationship type ‘Categorized As’ and the containing attributes.
- Flaw: Cardinality was not defined for the defined relationships.
  Correction: Appropriate cardinalities have been defined for relationships.

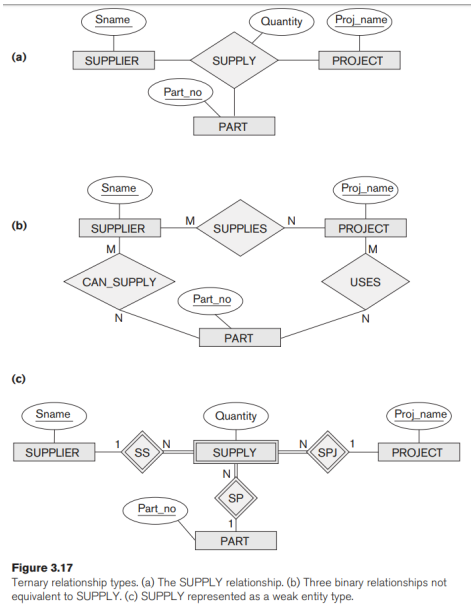


**Figure 3.17**
Ternary relationship types. (a) The SUPPLY relationship. (b) Three binary relationships not equivalent to SUPPLY. (c) SUPPLY represented as a weak entity type.

Figure 3: Example for converting a ternary relationship (a) to 3 binary relationships (c)

[1] "Some database design tools are based on variations of the ER model that permit only binary relationships. In this case, a ternary relationship such as SUPPLY must be represented as a weak entity type, with no partial key and with three identifying relationships."

-*Fundamentals of Database Systems*, Navathe, Elmasri