ORM Glossary

This glossary lists key terms and symbols used in Object-Role Modeling (ORM), and briefly explains their meaning. A concise explanation of other technical terms may be found in the chapter summaries. Further details on technical terms may be accessed by using the Index.

Alethic constraint: Constraint that holds necessarily for all states of the model.

Arity: Number of roles in a relationship (unary =1, binary = 2, ternary = 3, etc.).

Asserted fact: Fact that is simply asserted, rather than being derived from others; also called a primitive fact or base fact.

Asserted subtype: Subtype that is simply asserted (not defined by a subtype definition).

Association: Relationship type, usually involving at least two roles.

Atomic fact: Either an elementary fact or an existential fact.

Base fact: Fact that is primitive (not derived from others). Also called an asserted fact.

Compound fact type: Fact type that is equivalent to a conjunction of smaller fact types

Conceptual schema: Conceptual model of the UoD structure; design that specifies what states and transitions are possible; declaration of fact types, constraints, and derivation rules

Conceptual schema design procedure (CSDP):

0 Divide the UoD into manageable sub-sections
1 Transform familiar examples into elementary facts, and apply quality checks
2 Draw the fact types, and apply a population check
3 Check for entity types that should be combined, and note arithmetic derivations
4 Add uniqueness constraints, and check arity of fact types
5 Add mandatory role constraints, and check for logical derivations
6 Add value, set comparison (subset, equality, exclusion) and subtype constraints
7 Add other constraints and perform final checks
8 Integrate the subschemas into a global conceptual schema

Constraint: Restriction on possible or permissible states (static constraint) or transitions (dynamic constraint).

Compositely identified object type: Either a coreferenced or a nested object type.

Coreferenced object: Object that is identified by means of two or more reference types in combination; hence its identification scheme involves an external uniqueness constraint.

Database: Variable set of related fact instances.

Deontic rule: An obligation, i.e. a rule that ought to be obeyed (but possibly may be violated).

Derivation rule: Rule that declares how one fact type may be derived from others.

Derived fact: Fact that is derived from other fact types using a derivation rule

Derived subtype: Subtype that is derived from other object types using a subtype definition.

Elementary fact: Assertion that an object has a property, or that one or more objects participate in a relationship, where the fact cannot be split into simpler facts with the same object types without information loss. Application of an atomic predicate to a sequence of objects.

Entity: Object that is referenced by relating it to other objects (e.g., the Country that has CountryCode 'AU'); not a value; typically, an entity may undergo changes over time; an entity is either atomic or nested (i.e. an objectified relationship); at the top level, entities are partitioned into primitive entity types, from which subtypes may be defined.

Existential fact: Assertion that an object exists (e.g., there is a Country that has CountryCode 'AU'); also called a reference.

Fact: Proposition that is taken to be true by the relevant business community, where the proposition is elementary or existential (rather than being a constraint or derivation rule).

Fact role: Role in an elementary fact type.

Fact type: Kind of fact, including object terms and either a predicate or existential quantifier.

Flatten: Restate without nesting.

Functional fact type: Fact type with a functional role.

Functional role: Role with a simple uniqueness constraint.

Generalization: Forming a more general case from one or more specific cases; the inverse of specialization.

Independent object: Object that may exist without participating in any elementary fact; the disjunction of fact roles played by an independent object type is optional.

Instance: An individual occurrence (one specific member of a type).

Mandatory role: Role that must be played by all instances in the population of the object type playing the role; also called a total role.

Modality: Mode in which a proposition is expressed. In ORM 2, modalities are either alethic (expressing necessities or possibilites) or deontic (expressing obligations or permissions).

Nested object: Relationship that plays some role (also called an objectified relationship).

Object: Thing of interest; an object may be an entity or a value.

Objectification: Treating a relationship as an object; also called nesting. Strictly speaking, objectification in ORM 2 distinguishes the object formed by the objectification from the original relationship, and hence involves situational rather than propositional nominalization.

Object-Role Modeling (ORM): Conceptual modeling method that pictures a business domain in terms of objects playing roles; it provides graphical and textual languages for verbalizing and querying information as well as various design and transformation procedures.

Population: Set of instances present in a particular state of the database.

Predicate: Proposition with object-holes in it, e.g. "... works for ...".

Reference: Relationship used as the preferred way to reference or identify an object (or to provide part of the identification).

Reference mode: Mode or manner in which a single value references an entity; used to abbreviate simple reference schemes, e.g. (.code), (kg:).

Reference role: Role in a reference (existential fact).

Relationship: Property or association involving one or more objects.

Rigid subtype: Subtype whose instances must remain in that type for their whole lifetime (e.g, Person).

Rmap: Relational mapping procedure.

Role: Part played by an object in a relationship (unary, binary, ternary, etc.).

Role subtype: Subtype whose instances may leave that type during their lifetime (e.g., Child).

Semiderived fact type: Fact type. some of whose instances may be derived from others, while some other instances may be simply asserted.

Semiderived subtype: Subtype, some of whose instances may be derived using a derivation rule while some other instances may be simply asserted.

Subtype: Object type that is properly contained in another object type (e.g., Woman is a subtype of Person).

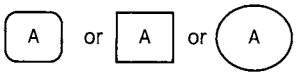
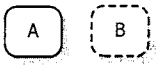
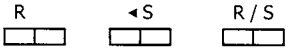
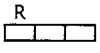
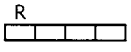
Type: Set of possible instances.

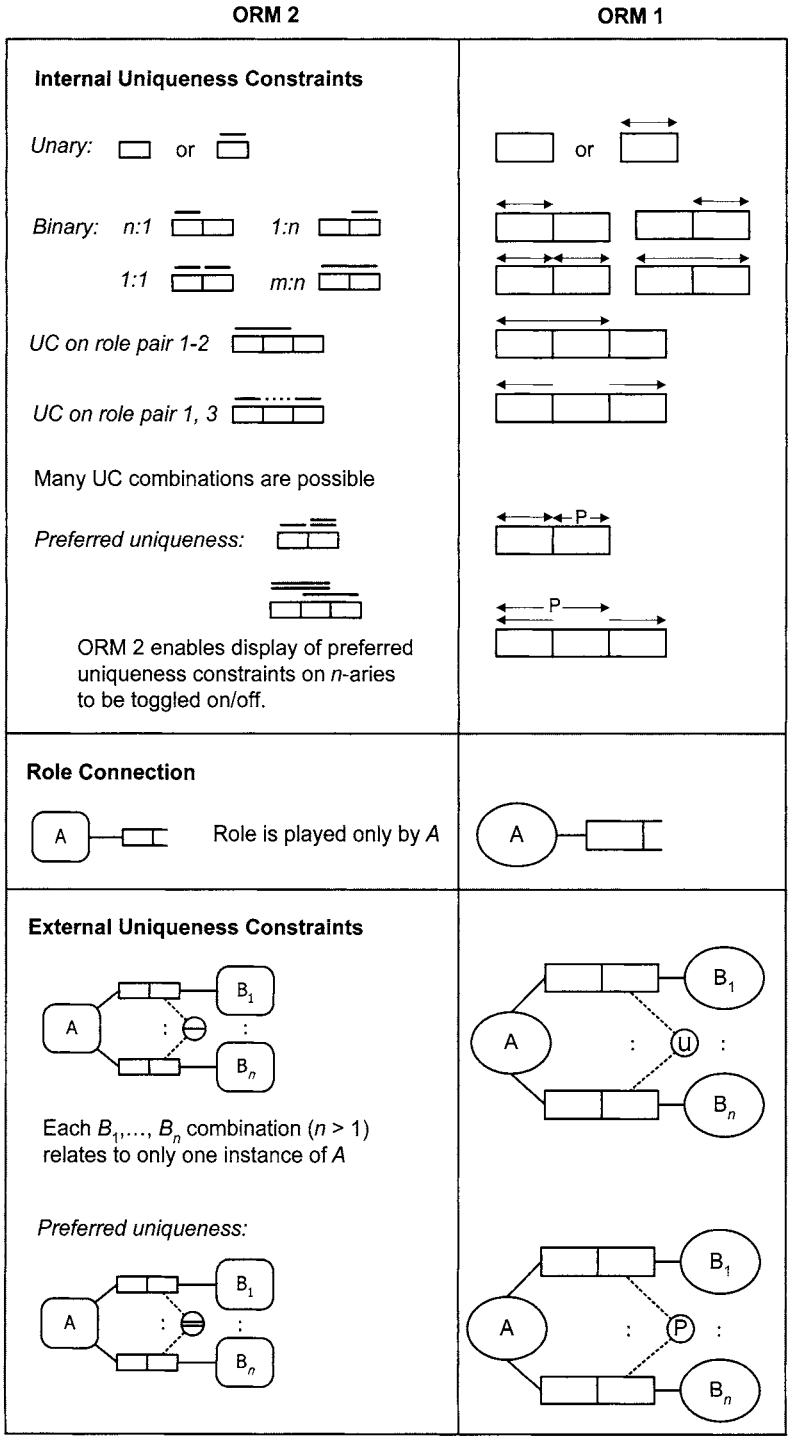
Uniqueness constraint (UC): Repetition is not allowed in the role or role sequence spanned by the constraint; a uniqueness constraint on a single predicate is an internal UC, and a uniqueness constraint over roles from different predicates is an external UC.

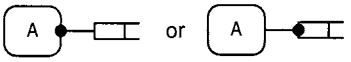
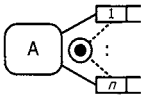
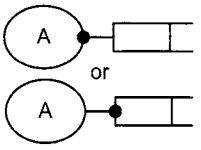
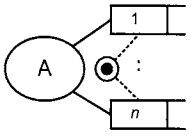
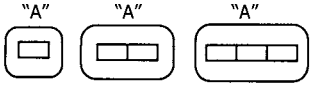
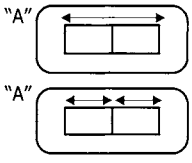
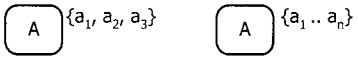
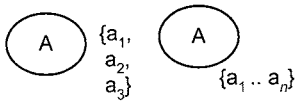
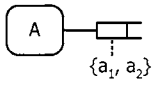
Universe of Discourse (UoD): Business domain (the aspects of the world that we want to talk about).

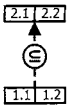
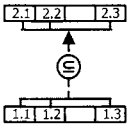
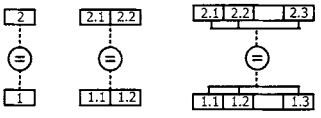
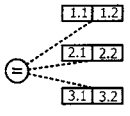
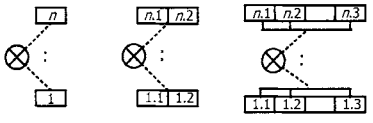
Value: Unchangeable object that is identified by a constant; in this book a value is either a character string or a number; sometimes called a label.

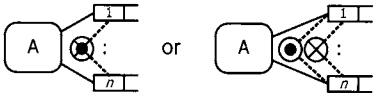
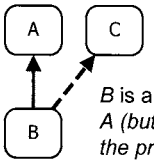
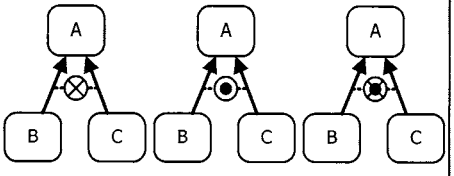
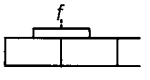
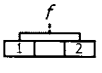
The following symbol glossary covers the main graphical symbols in ORM 2 (as supported by the NORMA tool) and the corresponding symbols in ORM 1 (as supported in Microsoft Visio for Enterprise Architects).

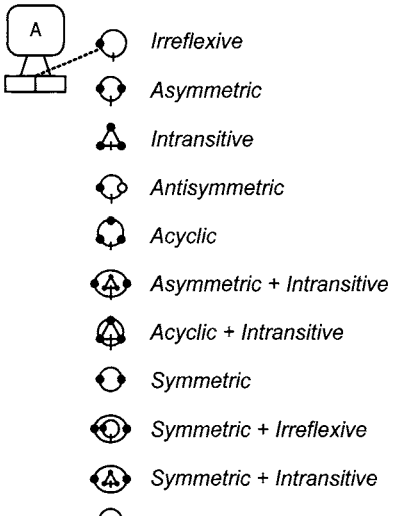
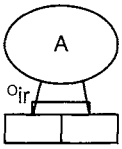
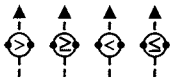
	ORM 2	ORM 1
Object Types		
Entity type A (first shape is the default) From now on, we show only the default shape.		
A identified by *reference mode Ref*		
Value type A		
Independent entity type A		
Independent value type A		Not supported.
Duplicated object types		Not supported.
External object type A	 To be finalized	
Predicates		
Unary:		Predicates are basically the same, except that role boxes are larger
Binary:	 Forward reading Inverse reading Both readings	
Ternary:		
Quaternary:		
etc. (*n* role-boxes for *n*-ary predicate)		
Role names		Role names may be entered but are not displayed


ORM 2
ORM 1
Internal Uniqueness Constraints
Unary:
or
Binary:
n:1
1:n
1:1
m:n
UC on role pair 1-2
UC on role pair 1, 3
Many UC combinations are possible
Preferred uniqueness:
ORM 2 enables display of preferred uniqueness constraints on n-aries to be toggled on/off.
P
Role Connection
A
Role is played only by A
External Uniqueness Constraints
B1
Bn
Each B1,..., Bn combination (n > 1) relates to only one instance of A
Preferred uniqueness:
U

ORM 2	ORM 1
Mandatory Role Constraints *Simple:*  Role is mandatory for population of *A* *Disjunctive (inclusive-or constraint):*  Each instance in the population of *A* plays at least one of the *n* attached roles ($n > 1$). Role numbers are not displayed.	 
Objectification  etc. Fact type is objectified as object type *A*. ORM 2 allows any fact type to be objectified.	ORM 1 does not support objectified unaries. It allows objectification only if for a spanning UC or a 1:1 pattern. 
Object Value Constraints *Enumeration* *Range*  *Semibounded discrete range* { a.. } { ..a } *Bounded continuous range* {[a_1 .. a_2]} *includes both end values* {(a_1 .. a_2)} *excludes both end values* {[a_1 .. a_2)} *includes first value* {(a_1 .. a_2]} *includes last value* Combinations are allowed.	 { a.. } { ..a } {a_1..a_2} ORM1 does not support exclusion of any end values Combinations are allowed.
Role Value Constraints  Same patterns as above	Not supported

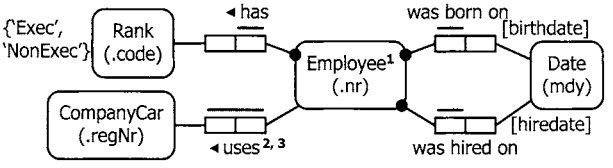
ORM 2	ORM 1
Subset Constraints	
Simple:  Each object that plays role 1 also plays role 2	Same
Contiguous Role-pair:  Each object pair that plays the role sequence 1.1, 1.2 also plays the role sequence 2.1, 2.2	Same
Other cases:  Each object tuple that plays the role sequence 1.1, 1.2, 1.3 also plays the role sequence 2.1, 2.2, 2.3	Same
ORM 2 also displays subset constraints over join paths	ORM 1 does not display subset constraints over join paths
Equality Constraints	
2 role-sequences (of 1 or more roles):  Populations of role-sequences must be equal	Same
3 or more role-sequences: e.g. 	Not supported (instead use multiple 2-sequence constraints)
Exclusion Constraints	
 Populations of 2 or more role-sequences must be mutually exclusive	Same

	ORM 2	ORM 1
Exclusive-Or Constraints	 Each instance in *A*'s population plays exactly one of the *n* attached roles (*n* > 1)	Same
Subtyping	 *B is a proper subtype of A and C. A (but not C) provides a path to the preferred identifier for A.*	*B* is a proper subtype of *A* (its primary supertype) and *C* (a secondary supertype)
	 *Exclusive* *Total* *Partition*	ORM 1 does not display constraints over subtyping connections
Frequency Constraints	 Each instance that plays role 1 does so *f* times	Same
	 Each instance pair that plays roles 1, 2 does so *f* times	
	 Each instance pair that plays roles 1, 2 does so *f* times	Same
	The frequency specification *f* may be any of the following	
	n exactly *n* (a positive integer) ≥ *n* at least *n* ≤ *n* at most *n* *n..m* at least *n* and at most *m*	*n* >=*n* <=*n* n..m

	ORM 2	ORM 1
Ring Constraints		 oas oit oans oac o(as,it) o(ac,it) osym o(ir,sym) o(it,sym) Not supported
Value-comparison Constraints		Not supported
Derived Fact Types * = derived, ** = derived and stored + = semi-derived		Same for first two options. 3rd option not supported.
Deontic Constraints Colored blue rather than violet. Most include "o" for "obligatory". Deontic ring constraints instead use dashed lines. *Uniqueness* *Mandatory* *Subset, Equality, Exclusion* *Frequency* of *Irreflexive* *Acyclic* *Asymmetric* *Asym-Intrans* *Intransitive* *Acyclic-Intrans* *Antisymmetric* *Symmetric* *Purely Reflexive* *etc.*		No deontic constraints are supported

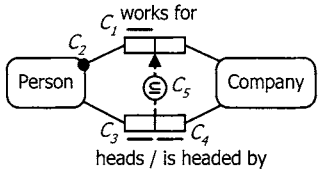
	ORM 2	ORM 1
Object Cardinality Constraints		
# = *n* *A*	Each population of *A* includes exactly *n* instances	
# ≤ *n* *A*	Each population of *A* includes at most *n* instances	Not supported
Role Cardinality Constraints		
A — # = *n* — *R*	Each population of *R* includes exactly *n* instances	
A — # ≤ *n* — *R*	Each population of *R* includes at most *n* instances	Not supported

Textual Constraints (ORM 2 example)



[1] **For each** Employee, birthdate < hiredate.
[2] **Each** Employee **who** has Rank 'NonExec' uses **at most one** CompanyCar.
[3] **Each** Employee **who** has Rank 'Exec' uses **some** CompanyCar.

Constraint Verbalization (ORM 2 example)



*C*1: **Each** Person works for **at most one** Company.
*C*2: **Each** Person works for **some** Company.
*C*3: **Each** Person heads **at most one** Company.
*C*4: **Each** Company is headed by **at most one** Person.
*C*5: **Each** Person **who** heads **some** Company **also** works for **that** Company.

The absence of a UC on the top righthand role verbalizes as

It is possible that more than one Person works for **the same** Company.