4.Consider substituting single-attribute surrogate identifiers for large composite identifiers. For example, an attribute called Game NUMBER could be used for the entity type game instead of the combination of home team and visiting team.

**Naming and defining attributes**

in addition to the general guidelines for naming data objects,there area few special guidelines for naming attributes ,which follow：

An attribute name is a singular noun or noun phrase [such as customer id

Age ,product minimum price ,or major ]attributes ,whish materialize as data values ,are concepts or physical characteristics of entities .concepts and physical characteristics are described by nouns .

An attribute name should be unique .no two attributes of the name entity type may have the same name ,and it is desirable ,for clarity purposes ,that no two attributes across all entity types have the same name .

To make an attribute name unique and for clarity purposes ,each attribute name should follow a standard format .for example ,your university may establish student GPA ,as opposed to GPA of student as an example of the standard format for attribute naming .the format to be used will be established by each organization .a common format is [entity type name [[qualifier]]class where [--]is an optional clause ,and [--]indicates that the clause may repeat .entity type name is the name of the entity wish whish the attribute is associated .class is phrase from a list of phrases defined by the organization that are the permissible characteristics or properties of entities [or abbreviations of these characteristics ].for example ,permissible values [and associated approved abbreviations ]for class might be name [nm],identifier [id],date [Dt],or amount [amt] .qualifier is a phrase from a list of phrase defined by the organization that are used to place constraints on classes .sometimes a qualifier is necessary .for example ,employee birth date and employee hire date two attributes of employee that require one qualifier .

Similar attributes of different entity types should use the same qualifier and classes ,as long as those are the names used in the organization .for example ,the city of residence for faculty and students should be ,respectively ,faculty residence city name and student residence city name.

There are also some specific guidelines for defining attributes,which follow:

An attribute definition states what the attribute is and possibly why it is important.The definition will often parallel the attribute’s name; for example,Student Residence City Name could be defined as “The name of the city in which a student maintains his or her permanent residence.”

An attribute definition should make it clear what is included and not included in the attribute’s value; for example,”Employee Monthly Salary Amount is the amount of money paid each month in the currency of the country of residence of the employee exclusive of any benefits,bonuses,reimbursements,or special payments.”

Any aliases,or alternative names,for the attribute can be specified in the definition or may be included elsewhere in documentation about the attribute,possibly stored in the repository of a CASE tool used to maintain data definitions.

It may also be desirable to state in the definition the source of values for the attribute.Stating the source may make the meaning of the data clearer.For example,”Customer Standard Industrial Code is an indication of the type of business for the customer.Values for this code come from a standard set of values provided by the Federal Trade Commission and are found on a CD we purchase named SIC provided annually by the FTC.”

An attribute definition (or other specification in a CASE tool repository) also should indicate if a value for the attribute is required or optional.This business rule about an attribute is important for maintaining data integrity.For example,”Employee Department ID is the identifier of the department to which the employee is assigned.An employee may not be assigned to a department when hired (so this attribute is initially optional),but once an employee is assigned to a department,the emplloy must always be assigned to some department.”

An attribute definition (or other specification in a CASE tool repository) may also indicate,whether a value for the attribute may change once a value is provided and before the entity instance is deleted.This business rule also controls data integrity.Nonintelligent identifiers may not change values over time.To assign a new nonintelligent identifier to an entity instance,that instance must first be deleted and then re-created.

For a multivalued attribute,the attribute definition should indicate the maximun and minimum number of occurrences of an attribute value for an entity instance.For example,”Employee Skill Name is the name of a skill an employee opssesses.Each employee must possess at least one skill,and an employee can choose to list at most 10 skills.”The reason for a multivalued attribute may be that a history of the attribute needs to be kept.For example,”Employee Yearly Absent Days Number is the number of days in a calendar year the employee has been absent from work.An employee is considered absent if he or she works less than 50 percent of the scheduled hours in the day.Avalue for this attribute should be dept for each year in which the employee works for our company.”

An attribute definition may also indicate any relationships that attribute has withother attributes.For example,”Employee Vacation Days Number is the number of days of paid vacation for the employee.If the employee has a value of ‘Exempt’for employee Type,then the maximum value for Employee Vacation Days Number is determined by a formula the number of years of service for the employee.

MODELING RELATIONSHIPS

Relationships are the glue that holds together the various components of an E-R model. Intuitively, a relationship is an association representing an interaction among the instances of one or more entity types that is of interest to the organization. Thus, a relationship has a verb phrase name. relationship and their characteristics (degree and cardinality ) represent business rules, and usually relationship represent the most complex business rules shown in an ERD. In other words, this is where data modeling gets really interesting and fun, as well as crucial for controlling the integrity of a database.

To understand relationships more clearly, we must distinguish between relationship types and relationship instances. To illustrate, consider the entity types EMPLOYEE and COURSE, where course represents training courses that may be taken by employees. To track courses that have been completed by particular employees, we define a relationship called completes between the two entity types [seen figure 2-10a].this is a many –to-many relationship ,because each employee may complete any number of courses [zero ,one ,or many courses ],whereas a given course may be completed by any number of employees [nobody ,one employee ,many employees].for example , in figure 2-10b,the employee melton has completed three courses[c++ cobol ,and perl].the sql course has been completed by two employees [celko and gosling ],and the visual basic course has not been completed by anyone.

In this example ,there are two entity types [employee and course ]that participate in the relationship named completes. in general ,any number of entity types [from two many ]may participate in a relationship .

We frequently use in this and subsequent chapters the convention of a single verb phrase label to represent a relationship .because relationship often occur due to an organizational event ,entity instance are related because an action was taken ;thus, a verb phrase is appropriate for the label .this verb phrase should be in the present tense and descributeptive. there are ,however ,many ways to represent a relationship.some data modelers prefer the format with two relationship names.one two name the relationship in each direction .one or two verb phrase have the same stecutural meaning,so you may use either format as long as the meaning of the relationship in each direction is clear.

”