Time the value becomes valid or stops being valid ;or the time when critical action were performed ，such as updates ,corrections,or audits.This situation is similar to the employee skill diagrams in Figure 2-15b;thus,an alternative ,not shown in Figure 2-19,is to make Price History a separate entity type,as was done with Skill using Microsoft Visio.

The use of simple time stamping (as in the preceding example)is often adequate for modeling time-dependent data.however,time can introduce subtler complexities to data modeling.For example,consider again Figure 2-17c.This figure is drawn for a given point in time,not to show history.if,on the other hand,we needed to record the full history of marriages for individuals,the Is Married To relationship would be an optional many-to-many relationship.Further,we might want to know the beginning and ending date(optional)of each marriage;these dates would be,similar to the bill-of-materials structure in Figure 2-13c,attributes of the relationship or associative entity.

We have discussed the problem of time-dependent data with managers in several organizations who are considered leaders in the use of data modeling and database management.Before the recent wave of financial reporting disclosure regulations,these discussions revealed that data models for operational databases were generally inadequate for handing time-dependent data,and that organizations often ignored this problem and hoped that the resulting inaccuracies balanced out.However,with these new regulations, you need to be alert to the complexities posed by time-dependent data as you develop data models in your organization. For a thorough explanation of time as a dimension of data modeling, see a series of articles by T.Johnson and R.Weis beginning in May 2007 in DM review (now Information Management)and accessible from the magazine archives section of the information center at of www.information –management.com

MODELING MULTIPLE RELATIONSHIPS BETWEEN ENTITY TYPES

There may be more than one relationship between the same entity types in a given organization.Two examples are shown in Figure 2-20.Figure 2-20a shows two

Assignment ).The name states the essence of the interaction between the participating entity types,not the process involved(e.g., use an Employee is Assigned To a project,not an Employee is Assigning a project)

You should avoid vague names,such as Has or Is Related To.Use descriptive,powerful verb phrases,often taken from the action verbs found in the definition of the relationship.

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

* A relationship definition explains what action taken and possibly why it is important. It may be important to state who or what does the action, but it is not important to explain how the action is taken. State the business objects involved in the relationship is natural, but because the E-R diagram shows what entity types are involved in the relationship and other definitions explain the entity types, you do not have to describe the business objects.
* It may also be important to give examples to clarify the action. For example, for a relationship of Registered For between student and course, it may be useful to explain that this covers both on-site and online registration and includes registrations made during the drop/add period.
* The definition should explain any optional participation. You should explain what conditions lead to zero associated instances, whether this can happen only when an entity instance is first created, or whether this can happen any time, For example, Registered For links a course with the students who have signed up to take the course ,and the courses a student has signed up to take. A course will have no students registered for it before the registration period begins and may never have any registered students. A student will not be registered for any courses before the registration period begins and may not register for any classes （or may register for classes and then drop any or all classes.）.”
* A relationship definition should also explain the reason for any explicit maximum cardinality other than many.For example,”Assigned To links an employee with the projects to which that employee is assigned and the employees assigned to a project.Due to our labor union agreement,an employee may not be assigned to more than four projects at a given time.”This example,typical of many upper-bound business rules,suggests that maximum cardinalities tend not to be permanent.In this example,the next labor union agreement could increase or decrease this limit Thus,the implementation of maximum cardinalities must be done to allow changes.
* A relationship definition should explain any mutually exclusive relationships .Mutually exclusive relationships are ones for which an entity instance can participate in only one of several alternative relationships .we will show examples of this situation in chapter 3 .For now ,consider the following example :”plays on links an intercollegiate sports team with its student players and indicates on which teams a student play .students who Play on intercollegiate sports teams cannot also work in a campus jib (i.e.,a student cannot be linked to both an intercollegiate sports team via plays on and a campus job via the works on relationship ).”another example of a mutually exclusive restriction is when an employee cannot both be supervised by and married to the same employee.
* A relationship definition should explain any restrictions on participation in the relationship.mutual exclusivity is one restriction ,but there can be others .For example ,”supervised by links an employee with the other employees he or she supervises and links an employee with the other employee who supervises him or her.An employee cannot supervise him-or herself, and an employee cannot supervise other employees if his or her job classification level is below 4.‘
* A relationship definition should explain the extent of history that is kept in the relationships .for example ,‘assigned to links a hospital bed with a patient .only the current bed assignment is stored .when a patient is not admitted ,that patient is not assigned to a bed ,and a bed may be vacant at any given point in time .”Another

Assignment).the name states the essence of the interaction between the participating entity types ,not the process involved (e.g.,use an employee is assigned to a project ,not an employee is assigning a project ).