8.3 TRANSACTION STATES REVISITED

Recall transaction states outlined in Section 8.1.4. We can extend the steps for a running transaction to include logging to support the transaction abort and database recovery. Note that what is logged depends on the mode of update—deferred versus immediate—as shown below (Sections 8.3.1 and 8.3.2).

8.3.1 Deferred Update Transaction Steps

The following depicts the transaction steps extended to include logging for a system that implements deferred updates.

```
1. Start_transaction
2. Log "Start"
3. Repeat
     3.1 Read a data item's "before-image"
     3.2 Compute the "after-image" for the data item
     3.3 If must abort then log "Abort" and exit
     3.4 Log the "after-image" of the data item
     3.5 Write the "after-image" of the data item
4. Until no more rows to process
5. Log "Commit"
6. Commit_transaction
7. End_transaction
```

8.3.2 Immediate Update Transaction Steps

The following depicts the transaction steps extended to include logging for a system that implements immediate updates.

```
1. Start_transaction
2. Log "Start"
3. Repeat
     3.1 Read a data item's "before-image"
     3.2 Log the "before-image" for the data item
     3.3 Compute the "after-image" for the data item
     3.4 If must abort then log "Abort" and exit
     3.5 Log the "after-image" of the data item
     3.6 Write the "after-image" of the data item
4. Until no more rows to process
5. Log "Commit"
6. Commit_transaction
7. End_transaction
```

A careful reader notices that the difference between the two sets of steps is the logging of the before-image of the data item for the immediate update approach. This step is not necessary for the deferred updates, since the old values of the items are in the stable storage and do not need to be logged.