ments, and if the fare for an O-D itinerary is lower than one of its constituent components (not uncommon in market-based pricing, as there may be competition on the O-D but not on the segments), a travel agent may be able to book the multisegment itinerary and cancel the unnecessary segment later. Or a travel agent may be able to book a block of seats on a fictional PNR to lock in cheap fares and then later fill in the passenger details or cancel them at will. A travel agent may be also able to make reservation on one GDS, then transfer it to another, and issue the tickets on the new GDS, doubling the GDS costs. And so on. The list of possible GDS abuses is endless and causes significant revenue leakage to airlines. Some of these are plain flaws in the product and restriction design, but if the GDS has limitations in implementation, a clever travel agent can always find ways around any restriction.

While the large airlines monitor travel-agency behavior and penalize violating firms (say, by cutting discounts), smaller airlines and hotels have little leverage to prevent these practices. In response, many RM systems have added functionality—and at times rather ad-hoc features—to prevent GDS flaws. For instance, as mentioned, airlines use married-segment logic to prevent agents from booking a through itinerary as two locals or from booking a through itinerary and then cancelling one segment to gain availability on a local flight. Managers in charge of the RM system must have a good working knowledge of the GDSs in order to intervene appropriately to prevent such abuse.

11.2.4 Retail Management Systems

Point-of-sale (POS) transaction databases are the central source of information for retail RM. These systems collect information from the point of sale, that—combined with product, inventory, price, and promotion information—gives a highly accurate picture of all shopping transactions in a store. A retail store management system (RMS) consists of a number of elements: POS terminals with attached bar-code readers, databases with product and inventory information, and EDI to connect to suppliers' ERP and supply-chain systems.

11.2.4.1 Bar Codes and POS Systems

Optical-scanner technology has revolutionized retail management. Almost all retail products today are encoded by a Universal Product Code (UPC),[8] a code consisting of 12 digits. The first digit represents the

[8]There are various flavors of UPC, but we describe the simplest and earliest one, what is called version A. Other standards include EAN (European Article Numbering), JAN (Japanese Article Numbering), ISBN, and code 39.