Second-generation technologies sometimes result from first-generation "enabling technologies" — that is, the original R&D investment makes possible the realization of other product improvements. For instance, one ERIP participant received a grant to develop a packing process that allows fruits and vegetables to be transported without refrigeration. With this packing system successfully in place, the inventor commissioned the development of a new hybrid tomato with a particularly appealing flavor that is retained during shipment because of the unrefrigerated packing and shipping process developed during the ERIP project. In this case the original technology was transformed by replacing a "base technology" (off-the-shelf fruits and vegetables) with a newly developed "key technology" (the new hybrid tomato).

4.2.3 Linkages between ERIP Technologies and their Spinoffs

One of the most important issues in evaluating spinoffs from ERIP investments is the nature and strength of the spinoff's linkage to the original ERIP support. Linkage is easiest to establish if the connection between the original technology and its spinoff is highly visible, such as support for core technology development or specific market applications. These linkages can be readily perceived in terms of modifications in products and processes or in the adoption and use of a technology by a new set of users. Other types of substantive linkages to the original technology development effort may be much less visible, such as critical support for business development activities.

Core technology linkages are the strongest connections, because they occur when the R&D investment was instrumental in developing a core technical ensemble with multifaceted potential for further development and application. In the case of the mixing technology previously described, the mixing device developed with ERIP support was then applied to a variety of spinoff market applications. Thus, the link between the initial core technology and the subsequent market application is strong.

A similar example is illustrated in Fig. 4.3. ERIP funds were applied to the development of a metal detector, which was a key technology in the initial technical core of a materials separation technology. The detection system was initially applied to recovery of aluminum and then modified to separate iron from municipal waste (the B-C transition in Fig. 4.3). The device to separate iron is considered a market application spinoff. The success of the initial detection system suggested a dramatic revision of the technology to allow detection of metal impurities in the production of silicon wafers (the C-D transition in Fig. 4.3). This development is considered a second-generation technology, and its application will be directed to dramatically different markets.

Application linkages occur when the supported project is intended to develop an alternative application of an already well developed core technology. In these instances, the linkage between the supported application and other outgrowths of the core technology is tenuous. Such is the case of