

to generating end-user demand. Several of the product innovations also involved process issues such as complex installation and maintenance procedures (e.g., the heat pump water heater, flame retention head oil burner, and microprocessor controlled refrigeration systems). In addition to contracting R&D to industrial partners in these cases, DOE undertook outreach activities to inform practitioners and subsidized the adoption process through training and education.

### 6.2.3 Complexity of the R&D Results

Complex technologies generally have high adoption costs and are therefore more difficult to establish in the marketplace. They are also more difficult to imitate, providing the initial innovating firm with the protection against competitors needed to make a licensing approach valuable.

Several of the innovations studied here are complex both in terms of understanding and use (e.g., the compressor system for supermarket refrigeration). For all the software case studies, the complexities are limited primarily to the internal algorithms - they are relatively simple to use. The radiant barrier is comparatively simple in all aspects: manufacture, use, and understanding.

Influencing key decision-makers and generating end-user demand appear to be particularly relevant for complex innovations because of the high adoption costs. They are less applicable to simple innovations as a subsidy for adoption, but may be important where credible, third-party information is needed about product performance (as with radiant barriers). Contracting R&D to industrial partners dominated as the primary strategy in the case of our more complex technologies, whereas influencing key decision-makers was used most frequently in the less complex cases (Fig. 6.5).