

Whether or not an application qualifies as sufficiently different to constitute a spinoff is sometimes difficult to assess. Employing concepts from Meyer and Roberts (1986), market newness increases as one moves from **existing or intended customers** to a **new market niche**, a **new market segment**, and an entirely **new market**. Using this terminology, we would consider anything other than the "existing or intended customers" to be different enough to be a spinoff application.

- (2) Second-generation technologies occur when the technology that was the subject of an R&D project is significantly altered and enhanced through subsequent R&D.

Adapting some of the concepts described in Meyer and Roberts (1986) to the measurement of technology newness, we distinguish between three different types of second-generation technologies: major enhancements, new/related technologies, and new/unrelated technologies. To apply this classification, it is first necessary to understand the concept of "core technologies" — the discrete, unique skills and techniques that embody a technology. Some of the components of this core are "key technologies" that provide the technology with its competitive edge and differentiate it from what is currently in the marketplace. Other components of the core are "base technologies" that are commonly available in the marketplace. **Major enhancements** occur through the addition of new base technologies to the core. **New/related technologies** occur through the addition or replacement of one or more key technologies, but the retention of some of the base technologies. **New/unrelated technologies** have no overlap with the key or base technologies that comprised the original technology. Minor incremental improvements are not considered here to constitute the kinds of change that herald a generational breakthrough.

4.2 ILLUSTRATIONS OF SPINOFFS FROM ERIP TECHNOLOGIES

4.2.1 Alternative Market Applications

Most of the spinoffs from the Energy-Related Inventions Program are alternative market applications. For instance, one ERIP inventor received a DOE grant to develop a thin conductive film to provide radiant heating in buildings. The film was subsequently used to create military decoys (for heat-seeking missiles) that were successfully deployed in Operation Desert Storm. Similarly, DOE provided a grant to an inventor to develop a process to recover finely crushed or powdered coal from refuse piles at coal mines. This application proved non-economic, but the technology has been successfully adapted as a belt filter press to dewater municipal wastes.

Alternative market applications may require little follow-on technical or business development to be useful in their new context. On the other hand, some technologies have required significant redesign and re-engineering to prepare them for their new uses.