# Despite the “fresh eyes” myth, it is deep knowledge that fuels high-value innovation

## Lessons from lithium-ion batteries: The most creative ideas come from leaning into what you already know.

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Sometimes we know something long before we can use it. Though lithium-ion batteries are the heart of the modern portable world, the basic understanding of how they might work has been around for decades. The enormous potential of lithium to develop light, powerful batteries was already well known by the late 1970s. But the first attempts to harness this power were, quite literally, explosive.

In the early 1980s, one of the first lithium-ion battery prototypes was developed based on earlier scientific advances. Even so, turning that knowledge into a functional battery required years of experimentation within the field of battery technology itself, testing different configurations of electrodes, electrolytes and materials.

The product itself arrived in 1991, when Sony launched the first rechargeable lithium-ion battery. It wasn’t an isolated discovery, but the result of an accumulative research process in which various specialists in materials science and electrochemistry refined and built upon knowledge developed over many years.

This case seems to defy the prevailing logic of innovation: The broader the search space, the greater the chances of finding original solutions. However, in some technological contexts, creativity emerges differently. The most valuable advances do not necessarily stem from new knowledge, but rather from delving deeply into a specific field until one understands its limits and discovers new possibilities within it.

A study by IESE's Bruno Cassiman and Paul-Emmanuel Anckaert (SKEMA Business School), published in *Industrial and Corporate Change*, analyzes the technological development of lithium-ion batteries and finds that the most creative inventions in the field — those that are both novel and highly valuable — are developed by inventors who exploit their own field-specific knowledge.

## The power of leveraging one's own knowledge

Innovation is often described as a process of combining existing knowledge in new ways. But not all mashups hold potential.

Cassiman and Anckaert examine what kind of knowledge inventors use when developing new technologies. Do they cite their own previous patents, reuse their prior scientific research or rely on knowledge generated by others?

The results show that inventors who leverage their accumulated pool of field-specific knowledge produce technologies that both have a larger impact and are more technically novel.

To measure the technological value of a patent, the authors use three indicators: the number of citations it receives from subsequent patents; whether the patent ranks among the top 10% most cited in its field; and how many years it remains active through renewal.

Novelty, meanwhile, is estimated by analyzing if the patents combine technical elements that had not been previously used.

## How experience drives creativity

These findings challenge a widely held belief in innovation management: That experience can lead to technological myopia.

According to this belief, experts tend to repeat known solutions, while newcomers bring fresh ideas. However, the research suggests that, with complex technologies, the opposite may be true.

# The interaction between science, innovation and technology

Another key discovery is the role played by the interaction between scientific research and developing technology.

Inventors who combine the two disciplines seem better able to produce significant advances. Knowledge generated in the lab can guide the process of technical exploration, while practical applications allow scientific ideas to be tested and refined. The two together foster creativity.

# Takeaways for R&D

For firms operating in the complex technology space, these results have various implications.

The first is that having inventors with deep field-specific knowledge can be a strategic advantage in boosting innovation.

Moreover, creating a research environment that allows inventors to develop that knowledge over time, by experimenting, learning from mistakes and combining scientific research with technological development, can foster new ideas and spark creativity.

**About the research**

The study analyzed 2,745 American patents related to lithium-ion batteries between 1992 and 2013, using the first appearance of this technology in 1991 to distinguish between inventors who had already acquired field-specific knowledge and those who entered the field later.

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