



## What Happens to Firms That Don't Adopt Dominant Technologies?

**Firms that choose the non-dominant technology in an industry shakeout can innovate in other ways.**

When we think about ordinary technologies that make our lives easier, we often forget that they are the result of a struggle in which one of multiple technologies emerged dominant. Cars, for example, were not always powered by petrol. In fact, one early iteration saw a cleaner **steam engine**, but the petrol engine became the dominant technology after the automobile's era of ferment. These technology shakeouts happen in many emerging industries, when their underlying technology is in a turbulent and rapid period of evolution.

One industry that recently went through its era of ferment is solar power. Solar industry innovators looked at various methods to harness power from the sun, including crystalline silicon (cSi), first developed in the 1950s and used in the production of microchips, and thin film, a cheaper but less efficient technology. Solar panels are connected packages of photovoltaic cells using cSi. At this point, the technology shakeout has put cSi on **top**.

In a recent **paper**, Rahul Kapoor of the Wharton School and I sought to understand how firms survive such industry shakeouts, especially if they adopted the non-dominant technology. We examined 218 solar industry firms that were either start-ups or existing firms that entered from another industry (diversifiers). We looked at how the two different types of firm might survive, even if cSi wasn't their

main technology. Rather than backing up the concept that technology always decides which firm succeeds, we found a more nuanced story about firms and their capabilities.

### **Design choices**

In the solar industry, there were two major technologies competing to be the standard: cSi and variants of thin film, including cadmium telluride and copper indium gallium selenide (CIGS). **Thin film** was exciting and its relative ease of use showed promise. Crystalline silicon is more complex to work with; it needs to be cut, polished and assembled.

But an industry's dominant design isn't necessarily based on the best technology. It might have to do with who has the most resources. In the solar industry, the dominant technology crystallised with the entry of **large Chinese firms** committed to international and domestic markets. Demand from these firms drove down the cost of cSi, establishing its dominance before other technologies could mature.

We found that firms that chose cSi or those that diversified were less likely to exit the market. In fact, diversifying firms that entered with cSi were 78 percent less likely to exit than diversifiers who

chose other technologies.

### The importance of integrated capabilities

Our research showed that integrated capabilities – a firm’s ability to coordinate activities and objectives within firm boundaries – made exit less likely for the diversifiers. A firm develops knowledge by operating across supply chains, by developing new products or by entering new industries. This understanding of how activities integrate together is especially valuable when firms face an industry shakeout.

Firms with integrated capabilities are better able to make dynamic moves in response to previous choices that placed them in a challenging position. These integrated capabilities allowed them to successfully navigate the market. When an era of ferment ends, executives need to think about the broader knowledge incorporated within their firms, whether or not they chose the dominant technology.

Some diversifiers realised the industry wasn’t for them and shifted to a different position. Maybe they decided to sell that part of a business and use their integrative capabilities elsewhere. People obsessed with failure tend to forget about this possibility.

### Strategies for firms that don’t choose “winners”

Solar industry firms that survived despite not choosing cSi had a few options, such as being acquired or adapting a different strategy. Both are good options, especially for firms with integrated capabilities, and act as buffers against potentially wrong choices.

#### *Reposition*

Some firms repositioned to a different part of the value chain. The companies that adapted found options and had a higher survival rate when they moved within the technology stack.

**First Solar** is a clear example of repositioning. Although it had originally intended to focus on the mainstream solar market, it adapted when the dominant design emerged and the industry shakeout began. It focused on utility-scale installations where it could use its own modules through controlling the design of the project.

The solar industry has been obsessed with making panels, which has led to a **glut** in the market. However, consumers aren’t interested in panels; they want electricity. In response, some firms realised that they could bundle **components** to create systems that produce electricity. They put their modules to use and captured value.

Even those firms that chose cSi could shift into different modes to capture more value.

#### *Niche market*

Other firms stepped back and focused on a niche market where one technology (maybe the non-dominant one) has an advantage over another.

For some non-traditional energy consumers – like boat owners or those who want to stay off-grid – thin film technology is more attractive. As off-grid solar energy systems require different hardware to store energy, they offer yet another market, or niche, for firms.

#### *Accept the acquisition*

In the case of an M&A, the acquirer gains a firm’s culture and knowledge, i.e. knowledge about how to manage supply or value chains, how to introduce products and so on.

Several start-ups pegged to thin-film CIGS technology were acquired and rolled up into a larger company called Hanergy. By banding small start-ups together, Hanergy was able to roll out alternative technologies on a greater scale than it could have on its own, giving it a chance to compete.

### Innovation is adaptation

Our research looked at the solar industry, but other industries are in their own eras of ferment today. Electric vehicles, for example, could shift the automobile industry to a very **different model** if the dominant technology turns out to be something approaching Tesla’s model of delivering both a product (a car) and the system to enjoy that car (e.g. charging stations).

Innovators need to be adaptable in terms of business models and technology. Organisations have different possible strategies if they end up not choosing the dominant technology. Even if they do choose it and face serious competition, they can still pivot, adapt and survive.

In technology, it’s not just about the product, it’s also about its niche or the system in which it’s embedded. More options pop up when a firm has integrated capabilities.

Remaining open to options is an important part of innovation. Thomas Edison said that all **10,000 iterations** of the lightbulb brought him to the one that worked. Failure is a teacher and it’s up to firms to have their own internal shakeouts to uncover those integrated capabilities that make them stronger.

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