

Why Some Technical Decisions Are Too Important to Leave to Engineers

Dr Kamal Munir

Summary

In the 1970s, the instant camera company Polaroid was riding high with a reputation for innovative, cutting-edge products. It was in that decade, however, that it made a decision to launch a new, highly ingenious fully integrated instant camera and film system called the SX-70, a decision that would have dramatic and devastating consequences for the company. Dr Kamal Munir of Judge Business School shows in this research how a seemingly innocuous technical decision to develop a new innovation can have unforeseen consequences on a company's production system, supply chain, vendor networks and the financial markets.

Article

In 1972, Polaroid launched the SX-70, the first fully integrated instant camera and film system, hailed by *Fortune* magazine as one of the greatest industrial inventions of the time.

In achieving this amazing innovation, which made the cover of *Life* magazine, Polaroid also incurred a huge organisational and strategic cost, says Judge Business School's Dr Kamal Munir who has conducted extensive research on the topic.

Polaroid's story, though more than three decades old, holds some very pertinent lessons for today's managers on how they manage innovation.

As Polaroid journeyed painfully from heroic status in the 60s (similar to the way Apple was seen in the 80s, says Munir) to Chapter 11 bankruptcy in 2001, its story stands as a case study in failure. With the benefit of hindsight, says Munir, the company would have curbed its creativity and innovativeness.

"Some technical decisions are too important to leave to engineers," says Munir. Seemingly small, technical decisions can have disproportionately large effects that "ripple" across the overall production system and supply chain network and beyond to vendor networks and the financial markets. Managers need to think about such effects before they decide on a major technological change, says Munir.

Before the new innovation radically altered things, Polaroid was responsible for a relatively small part of the manufacturing. It made the positive part of the instant film, the pod which contained the chemical reagent that was spread through the middle of the positive-negative film sandwich and some of the final assembly.

The rest was outsourced. The manufacturing of the camera was contracted out to a number of companies such as Bell & Howell, and Kodak produced the colour negatives for which it received \$1 for every film sold and reportedly made a pre-tax profit of 80 per cent.

The technology behind the SX-70 was so new that Polaroid's previous production network would have to be shaken-up. For one thing, the new film integrated the negative and positive elements into one, made up of thirteen layers of different chemical compounds, the whole thing being no thicker than a pencil line.

This innovation improved the experience for the user. But it also altered the interface between the positive and negative part of the film. Henceforward, it would no longer be possible to separate the two parts as previously between Polaroid and Kodak.

No doubt, the innovation was ground-breaking. The technology was considered "technologically impossible" at the time, says Munir. "So these guys were pushing the boundaries of not only technology but of science itself. They needed a chemical compound they called the 'opacifier', which would cover the picture, know when the picture had developed and then vanish by itself leaving no trace. No-one knew the chemical composition of such a thing. So they had to experiment, they didn't know if it was possible. But they decided to do it."

But unbeknown to Polaroid, their seemingly calm and successful relationship with Kodak was soon to be rocked by the new invention, with tragic consequences for them. Says Munir: "Given the uncertainty inherent in radical product innovation, Polaroid decided to go it alone this time, and politely informed Kodak that for the SX-70, it would be making its own negatives." Rather than re-negotiating their existing contract, Kodak broke off all relations with the smaller company, essentially saying: "How dare you take us out of your production network."

Given that Kodak had never been willing to share any of its knowledge about negative-manufacturing with Polaroid, the option of a joint venture was also out of the question. "Kodak rejected the possibility of working with Polaroid and announced they would introduce their own version of the new camera and compete with them," says Munir.

After this declaration of war, Polaroid decided to develop the new film in-house in addition to taking on all other negative production, saddling it with new and unwanted manufacturing expenses. Now, under pressure to compete with Kodak, Polaroid decided to make the SX-70 more complex in the hope that this would impede Kodak's progress in inventing its own version. They were determined to speed-up the launch of the SX-70, again to beat Kodak, but also to re-assure Wall Street. Both consequences increased the strains on Polaroid.

The decision to design a new interface between negative and positive was not the only technical decision to cause organisational and network level changes. Polaroid also decided to create a new battery to fit into every film, rather than the camera. It was a brilliant technological idea, which ensured that each time you put in a new film, you had a fresh set of batteries. But such a battery would have to be wafer thin and yet meet all the power requirements. This called for an unprecedented design.

So Polaroid went to one of the biggest battery manufacturers of the time, ESB, to outsource the work. Encouraged by Polaroid's reputation for engineering brilliance, they agreed to take on the challenge. But the separation or modularisation of the battery and film was again riddled with problems. The biggest of these problems was that, given the proximity of the two components, vapours from the batteries reacted with the film giving the pictures a blue tinge.

This in turn, marred the launch of the product, damaged sales as well as Polaroid's relations with its vendor network. Diagnosis of the problem was not easy, according to Munir: "Neither side accepted that they were responsible for the problem, with ESB claiming that the problem must lie with the film".

With the market, vendors and Wall Street breathing down their neck, Polaroid had to take battery manufacturing in-house as well. "They became the biggest manufacturer of batteries in America. They never wanted to be. They started off as a design shop and they wanted to remain a design shop. But by the end of this innovation they had become a fully-fledged vertically-integrated manufacturing company," says Munir.

Polaroid's decline had started. Its highly revered, charismatic and brilliant President, Edwin Land became the first casualty of this affair, and Polaroid never recovered, ultimately filing for Chapter 11 in October 2001.

The lesson is clear, says Munir. "Managers should make an effort to learn about the technologies embodied in their product. Tinkering with product architecture without realising how the production network works, competencies are arranged and modules are configured, can wreak havoc and lead to unexpected and undesirable consequences.

"Technical innovations have social analogues, implications for the network in which the firm is embedded. In Polaroid's case, technical decisions taken in the course of innovation ended up alienating important stakeholders, eventually leading to the fall of this highly creative company. Learning from Polaroid's example can save managers much grief."

Further reading

Garud, R. and Munir, K. (2008) "From transaction to transformation costs: the case of Polaroid's SX-70 camera." *Research Policy*, 37(4): 690-705

> Research article produced by Morice Mendoza