



Meltdown in the ice industry

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The Trouble with Innovation . . .

Back in the 1880s there was a thriving industry in the north-eastern United States in the lucrative business of selling ice. The business model was deceptively simple—work hard to cut chunks of ice out of the frozen northern wastes, wrap the harvest quickly, and ship it as quickly as possible to the warmer southern states (and increasingly overseas) where it could be used to preserve food. In its heyday this was a big industry—in 1886 the record harvest ran to 25 million tons—and it employed thousands of people in cutting, storing, and shipping the product. And it was an industry with strong commitment to innovation—developments in ice cutting, snow ploughs, insulation techniques, and logistics underpinned the industry’s strong growth. The impact of these innovations was significant—they enabled, for example, an expansion of markets to far-flung locations like Hong Kong, Bombay, and Rio de Janeiro where, despite the distance and journey times, sufficient ice remained of cargoes originally loaded in ports like Boston to make the venture highly profitable.

But at the same time as this highly efficient system was growing researchers like the young Carl von Linde were working in their laboratories on the emerging problems of refrigeration. It wasn’t long before artificial ice making became a reality—Joseph Perkins had demonstrated that vaporizing and condensing a volatile liquid in a closed system would do the job and in doing so outlined the basic architecture which underpins today’s refrigerators. In 1870 Linde published his research and by 1873 a patented commercial refrigeration system was on the market. In the years which followed the industry grew—in 1879 there were 35 plants and ten years later 222 making artificial ice.

Effectively this development sounded the death knell for the ice-harvesting industry—although it took a long time to go under. For a while both industries grew alongside each other, learning and innovating along their different pathways and expanding the overall market for ice—for example, by feeding the growing urban demand to fill domestic ‘ice boxes.’ But inevitably the new technology took over as the old harvesting model reached the limits of what it could achieve in terms of technological efficiencies. Significantly most of the established ice harvesters were too locked in to the old model to make the transition and so went under—to be replaced by the new refrigeration industry dominated by new entrant firms.

Now let’s wind the film forwards to the last part of the twentieth century and a very different industry—the computer disk drive business. Just like the ice industry before it, a thriving sector in which the voracious demands of the growing mini-computer industry for powerful machines for engineering, banking, and others meant there was a booming market for disk drive storage units. Around 120 players populated what had become an industry worth \$18 bn in 1995— and like their ice predecessors, it was a richly innovative industry. Firms worked closely with their customers, understanding the particular needs and demands for more storage capacity, faster access times, smaller footprints, etc. But just like our ice industry, the virtuous circle was about to be broken—in this case not by a radical technological shift but by the emergence of a new market with very different needs and expectations.

Whilst the emphasis in the mini- computer world was on high performance and the requirement for

storage units correspondingly technologically sophisticated, the emerging market for personal computers had a very different shape. These were much less clever machines, capable of running much simpler software and with massively inferior performance—but at a price which a very different set of people could afford. Importantly, although simpler they were capable of doing most of the basic tasks which a much wider market was interested in—simple arithmetical calculations, word processing, and basic graphics. As the market grew so the learning effects meant that these capabilities improved—but from a much lower cost base.

The effect was, in the end, just like that of Linde on the ice industry—but from a different direction. Of the major manufacturers in the disk drive industry in the 1990s only a handful survived—and leadership in the new industry shifted to new entrant firms working with a very different model.

These are not isolated examples but typical of a pattern in innovation. Think about the revolution in flying which the low-cost carriers have brought about. Here the challenge came via a new business model rather than technology— based on the premise that if prices could be kept low a large new market could be opened up. In order to make low prices pay a number of problems needed solving— keeping load factors high, cutting administration costs, enabling rapid turnaround times at terminals— but once the model began to work it attracted not only new customers but increasingly established flyers who saw the advantages of lower prices.

What these—and many other examples—have in common is that they represent the challenge of *discontinuous* innovation. None of the industries was lacking in innovation or a commitment to further change. However, the ice harvesters, mini-computer disk companies, or the established airlines all carried on their innovation on a stage covered with a relatively predictable carpet. But shifts in technology, in new market emergence, or in new business models pulled this carpet out from under the firms—and created a new set of conditions on which a new game would be played out. The trouble is that under such conditions, it is the new players who tend to do better because they don't have to wrestle with learning new tricks and letting go of their old ones. This is why discontinuous changes can often be disruptive to established players. And why this makes learning to anticipate and deal with such conditions a key strategic challenge for established players—and a wonderfully rich opportunity for new entrepreneurial players.

For a detailed discussion of the ice industry case see James Utterback, 'Mastering the dynamics of innovation', MIT Press, 1994.