

1.6 Christensen's Disruptive Innovation Theory

Although major advances or breakthroughs along the *technological* frontier can disrupt the rules of the game they are not the only mechanism. For example, Box 1.4 gives some examples where the technological leaders in industrial sectors found themselves in deep trouble as a result of changes in the ways *existing* technological knowledge was deployed.

The influential work of Clayton Christensen drew attention to cases where the *market* was the effective trigger point. He studied a number of industries in depth and particularly focused on the hard disk drive sector because it represented an industry where a number of generations of dominant design could be found within a relatively short history.⁴⁷

BOX 1.4

TECHNOLOGICAL EXCELLENCE MAY NOT BE ENOUGH . . .

In the 1970s Xerox was the dominant player in photocopiers, having built the industry from its early days when it was founded on the radical technology pioneered by Chester Carlsen and the Battelle Institute. But despite their prowess in the core technologies and continuing investment in maintaining an edge it found itself seriously threatened by a new generation of small copiers developed by new entrants including several Japanese players. Despite the fact that Xerox had enormous experience in the industry and a deep understanding of the core technology it took them almost eight years of mishaps and false starts to introduce a competitive product. In that time Xerox lost around half its market share and suffered severe financial problems. As Henderson and Clark put it, in describing this case, 'apparently modest changes to the existing technology . . . have quite dramatic consequences'.³³

In similar fashion in the 1950s the electronics giant RCA developed a prototype portable transistor-based radio using technologies which it had come to understand well. However, it saw little reason to promote such an apparently inferior technology and continued to develop and build its high range devices. By contrast Sony used it to gain access to the consumer market and to build a whole generation of portable consumer devices – and in the process acquired considerable technological experience which enabled them to enter and compete successfully in higher value, more complex markets.⁴⁰

His distinctive observation was that with each generation almost all of the previously successful players in what was a multimillion dollar market failed to make the transition effectively and were often squeezed out of the market or into bankruptcy (see Table 1.3). In 1976 there were 17 major firms in the industry; by 1995 of these only IBM remained a player. During that period 129 firms had entered the industry – but 109 exited. Yet these were not non-innovative firms – quite the reverse. They were textbook examples of good practice, ploughing a high percentage of sales back into R&D, working closely with lead users to understand their needs and develop product innovations alongside them, delivering a steady stream of continuous product and process innovations and systematically exploring the full extent of the innovation space defined by their market. So what explains why such apparently smart firms fail?

The answer was not their failure to cope with a breakthrough in the technological frontier – indeed, all of the technologies which were involved in the new dominant designs for each generation were well-established and many of them had originated in the laboratories of the existing (and later disrupted) incumbents. What was changing was the emergence of new *markets* with very different needs and expectations. Generally these involved players who were looking for something simpler and cheaper to meet a very different set of needs – essentially outside or at the fringes of the mainstream.

For example the pioneers of the personal computer (Apple, Atari, Commodore, etc.) in the mid-1970s were trying to make a machine for the home and hobby market – but for a fraction of the price and with much less functionality than the existing mainstream mini-computer market where high capacity, fast access disk drives were required. Messrs Jobs, Wozniak and colleagues would be quite satisfied with something much less impressive technically but available to fit the tight budget of the kind of hobbyists to whom their product was initially addressed. The trouble was that they were not taken seriously as an alternative market prospect by the established suppliers of disk drives.

TABLE 1.3 Changing shape of US disk drive industry (derived from Christensen⁴⁷)

Time frame	1970	1975	1980	1984	1990
Dominant size inches	14	8	5.25	3.5	2.5
Main market applications	Mainframes	Mini computers	Desktops	Laptops	Advanced laptops
Main manufacturers	IBM Plug compatible manufacturers CDC	Shugart Priam Quantum Micropolis Ampex	Seagate Computer Memories International Memories	Rodime Conner Peripherals	Seagate Quantum Western Digital

In essence the existing players were too good at working with their mainstream users and failed to see the longer-term potential in the newly emerging market. Their systems for picking up signals about user needs and feeding these into the product development process were all geared around a market for machines for running sophisticated engineering and financial applications software. And their success in meeting these needs helped their businesses to grow through keeping up with that industry. We shouldn't be surprised at this – new markets do not emerge in their full scale or with clearly identifiable needs but start out as messy, uncertain and risky places with small size and dubious growth prospects. The early days of the PC industry were characterized by enthusiasm amongst a group of nerds and geeks running small and highly speculative ventures. These hardly represented a serious alternative market to the multibillion dollar business of supplying the makers of mainstream mini-computers. As Steve Jobs described their attempts to engage interest, "So we went to Atari and said, "Hey, we've got this amazing thing, even built with some of your parts, and what do you think about funding us? Or we'll give it to you. We just want to do it. Pay our salary, we'll come work for you." And they said, "No." So then we went to Hewlett-Packard, and they said, "Hey, we don't need you. You haven't got through college yet.""⁴⁸

But while these markets appeared irrelevant to mainstream players their requirements gave the outline specification for what would become a new dominant design based on a significantly different price/performance configuration. As the new market grew so the technology around delivering the dominant design matured and became more reliable and capable – as we would predict using the Abernathy and Utterback model. Eventually it became able to meet not only the needs of the new market but also those of the original business – but from a position of much more attractive price/performance. At this point the makers of mini-computers began to see significant benefits in using drives which were based on a different dominant design but which would still give them the functionality they needed – only much more cheaply.

It is here that market *disruption* emerges – what began as a fringe business has moved into the mainstream and eventually changes the rules under which the mainstream operates. By the time the established suppliers of disk drives to the mainstream industry woke up to what was happening the best they could do was to imitate but from a position of being far behind the learning curve. Not surprisingly in many cases they failed to make the grade and withdrew or went bankrupt.

Importantly the new players who rewrote rule book for one generation found their markets disrupted in turn by a later generation of players doing the same thing to them. This underlines the point that it is not stupid firms who suffer this kind of disruption – rather it is the fact that the recipe for success in following a new dominant design becomes one which shapes the signals firms perceive about future opportunities and

the ways in which they allocate resources to them. Riding along on one particular bandwagon makes the enterprise vulnerable in its ability to jump on to the next one when it starts to roll.

The pattern of disruptive innovation can be seen in a variety of industries – for example mini-mills disrupting the market for integrated large-scale steel producers or manufacturers of mechanical excavators finding their world challenged by a new breed of smaller, simpler hydraulic equipment. In later work Christensen and Raynor have extended this powerful market-linked analysis to deal with two dimensions of discontinuity – where disruption occurs because of a new bundle of performance parameters competing against existing markets and where it competes against non-consumption. Effectively the latter case is about creating completely new markets.⁴⁰

The **key challenge** which organizations find difficult to deal with in these cases is **not technological advance but rather a change in the technology/needs configuration for new and mainstream markets**. The ‘innovator’s dilemma’ in the title of Christensen’s first book refers to the difficulties established players have in simultaneously managing the steady-state (sustaining) and the discontinuous (disruptive) aspects.

At its heart this powerful theory is a challenge to the ways in which we approach managing innovation. Sustaining conditions require innovation but along very different tracks – and involving very different networks – to disruptive conditions. The track record of existing players to ride both horses is poor but they face the need to deal with this innovator’s dilemma. **Either they surrender the ground to newcomers or they spin off new ventures and become newcomers themselves**. A third option involving balancing the two – **ambidextrous capability** – is a tough challenge but one we pose throughout the book.

1.7 Other Sources of Discontinuity

This problem – of managing both the discontinuous and the steady state – emerges frequently and can be triggered **not only by radical technology or significant market change**. For example, it can come from dramatic breakthroughs in technology or by clever **use of existing technology in a new configuration for a newly emerging market**. It can come from **reframing a business model** – such as has happened with the ‘reinvention’ of the airline industry around low-cost models. Or it can come from an external shock forcing change on an industry or sector – as is often the case in wartime.

Table 1.4 gives some examples of such triggers for discontinuity. Common to these from an innovation management point of view is the need to recognize that under discontinuous conditions (which thankfully don’t emerge every day) we need different