

Business Model Innovation: Opportunities and Barriers

Henry Chesbrough

Companies commercialize new ideas and technologies through their business models. While companies may have extensive investments and processes for exploring new ideas and technologies, they often have little if any ability to innovate the business models through which these inputs will pass. This matters - the same idea or technology taken to market through two different business models will yield two different economic outcomes. So it makes good business sense for companies to develop the capability to innovate their business models.

This paper explores the barriers to business model innovation, which previous academic research has identified as including conflicts with existing assets and business models, as well as cognition in understanding these barriers. Processes of experimentation and effectuation, and the successful leadership of organizational change must be brought to bear in order to overcome these barriers. Some examples of business model innovation are provided to underline its importance, in hopes of inspiring managers and academics to take these challenges on.

© 2009 Elsevier Ltd. All rights reserved.

a mediocre technology pursued within a great business model may be more valuable than a great technology exploited via a mediocre business model

Introduction

Technology by itself has no single objective value. The economic value of a technology remains latent until it is commercialized in some way via a business model. The same technology commercialized in two different ways will yield two different returns. In some instances, an innovation can successfully employ a business model already familiar to the firm, while, other times, a company will have a business model that can make use of the technology via licensing. In still other cases,

though, a potential new technology may have no obvious business model, and in such cases technology managers must expand their perspectives to find an appropriate business model in order to be able to capture value from that technology. [In fact, it is probably true that a mediocre technology pursued within a great business model may be more valuable than a great technology exploited via a mediocre business model.] Unless a suitable model can be found, these technologies will yield less value to the firm than they otherwise might — and if others, outside the firm, uncover a business model more suited for a given technology, they may realize far more value from it than the firm that originally discovered the technology.

To begin at the beginning — what is a business model? In previous work with my colleague Richard Rosenbloom we have suggested that a business model fulfils the following functions:¹

- Articulates the value proposition (i.e., the value created for users by an offering based on technology);
- Identifies a market segment and specify the revenue generation mechanism (i.e., users to whom technology is useful and for what purpose);
- Defines the structure of the value chain required to create and distribute the offering and complementary assets needed to support position in the chain;
- Details the revenue mechanism(s) by which the firm will be paid for the offering;
- Estimates the cost structure and profit potential (given value proposition and value chain structure);
- Describes the position of the firm within the value network linking suppliers and customers (incl. identifying potential complementors and competitors); and
- Formulates the competitive strategy by which the innovating firm will gain and hold advantage over rivals.

I came to understand the importance of business models through a research program conducted with the cooperation of the Xerox Corporation, particularly their (now retired) CTO, Mark Myers. This research examined in detail the activity history surrounding more than 35 technology projects throughout Xerox's five research laboratories around the world. By design, I selected projects that were judged not worth pursuing internally within Xerox, and were either pushed outside the company, or allowed to leave if a researcher wanted to continue the project after Xerox terminated its support internally. I then followed the subsequent experience of each of these projects after their departure from Xerox. It eventually became clear that the many research projects that remained within Xerox's R&D system (and proved to be quite valuable economically) differed from those that left Xerox in one important respect: the former fitted well with Xerox's business model, while those that 'went outside' did not. Thus, to understand Xerox's technology innovation successes and failures, one has to grapple with Xerox's business model.

In the 1980s, Xerox was known as 'the copier company' — it made industry leading copiers and also printers. While these products were profitable in their own right, the really big money was in the consumables (especially toner and paper) they required: and, therefore, the higher the copy or print volumes of each machine sold, the greater the returns for Xerox. So Xerox's business model searched widely (and effectively) for technologies that would enable more copies, faster. Xerox's business model motivated them to develop ever-faster machines that could handle very high copy volumes, and had maximum machine uptime and availability. This resulted in a strong cognitive bias within Xerox whose business model discouraged the development of low-speed personal copiers. As Xerox's CEO at the time observed later: '*...our profits came from how many copies were made on those machines. If a copier was slow in generating copies, that was money plucked out of our pocket*'.²

At that same time, however, Xerox was funding significant industrial research activity - most prominently developed at its Palo Alto Research Center (PARC) - in the domains of man-machine interfaces and other key building blocks of what would go on to become the personal computer industry. Some of this work, such as semiconductor diode lasers, and the technologies that assisted

users in identifying the source of a copier malfunction so the user could fix the copier without calling in an outside service technician, did assist the copier and printer business. But much of the work developed at this time — which later gave rise to the point-and-click user interface as well as Ethernet, Postscript, and many other technologies - lacked any obvious way to increase the volume or quality of copies made by a Xerox copier.

Xerox literally did not know what to do with these technologies ...[they were] ‘orphans’ in the company.

In fact, Xerox literally did not know what to do with these technologies, which became ‘orphans’ within the company. While the research was solid, and was publicized quite effectively, the sales and marketing executives at Xerox could see no clear way to profit from them. 35 of these projects were either shown the door, or the scientists working on the projects got fed up with the internal delays, and took the project to the outside world on their own. Although my research found that most of them were ultimately not successful outside Xerox, a few subsequently became very valuable. Significantly, none of the valuable projects employed a business model similar that of the Xerox copier or printer - their journey to success involved each of them identifying very different business models.

Based on this research, I would argue that a company has at least as much value to gain from developing an innovative new business model as from developing an innovative new technology. Like Xerox, however, companies have many more processes, and a much stronger shared sense of how to innovate technology, than they do about how to innovate business models. And that is the point of this article: companies need to develop the capability to innovate their business models, as well as their ideas and technologies.

An example of business model innovation among Xerox spinoffs: 3Com

To illustrate business model innovation, I will briefly recap the story of 3Com - one of the technology spinoffs examined in my earlier study. 3Com’s business model did not emerge fully formed - in fact, it was the product of extensive experimentation. This example shows how business model innovation is not a matter of superior foresight *ex ante* — rather, it requires significant trial and error, and quite a bit of adaptation *ex post*.

3Com commercialized the Ethernet networking protocol created at PARC, which, while it proved quite valuable later for computers, offered real and immediate benefits to copiers as well, by enabling Xerox to use a single wiring harness to support a variety of equipment configurations in its copiers and printers and connect its proprietary devices and options. Xerox sought to reduce its cost, and leased the Ethernet technology in 1979 to a former PARC employee, Robert Metcalfe, who had invented it while on its staff, for a one-time payment of \$1,000, Metcalfe, in turn, worked with DEC and Intel to create a standard around the Ethernet protocol.

Although this approach benefited Xerox, the technology proved in time to hold a much greater opportunity for creating value: in developing and controlling an important industry standard for networking computers, printers, and file servers. This opportunity was not lost on Metcalfe. Armed with his license from Xerox, and with the Ethernet standard that was supported by DEC and Intel,³ he raised venture capital and started 3Com. He initially targeted the Unix workstation market, with the intention of utilizing his own direct sales force, using the business model of a systems company with its own distribution organization: not too dissimilar from that of Xerox itself. But that is not how matters ended up. His work on the Ethernet standard made Metcalfe known to a small but ardent group of people in the emerging Local Area Networking (LAN) market and among his activities he compiled (with his wife) a directory of LAN dealers and resellers, which sold for \$125 a copy.

As a result of these and other experiments, Metcalfe changed his business model. As he was establishing 3Com, the IBM PC was launched, and opened up a new market area which quickly eclipsed the originally targeted Unix market. So he went after the IBM PC market, initially intending to

develop his own direct sales force, but soon shifting to distributing his products through retailers and value-added resellers — many of whom were entries in his directory of LAN dealers.

Ethernet turned out to be far more valuable as an independent product and standard than as an internal wiring harness component.

Ethernet turned out to be far more valuable as an independent product and standard for local area networking than as an internal Xerox component for copier wiring harnesses. Instead of designing, manufacturing, and marketing entire computer systems (as Xerox did) 3Com limited its business to designing add-in boards to provide networking capabilities to IBM compatible personal computers and shared laser printers. 3Com went public in 1984 and has continued to operate for many years as a public company. Neither the many experiments Metcalfe conducted on his business model, nor the resulting model he deployed, would likely have happened inside Xerox's business model.

More recent examples of business model experimentation

We also can see the importance of business model experimentation in more recent examples. One concerns the October 2007 launch of 'In Rainbows', Radiohead's most recent CD. For various reasons, the band's managers decided not to follow the conventional release process with its record company, EMI but, as an experiment, to release the CD on the band's website. Fans were invited to pay whatever they wished for the tracks, which also offered a collector's box set and other merchandise.

The problems with the music recording industry's business model are well known: its traditional business model was failing and revenues and profits were falling rapidly. CD unit sales are down substantially from just a few years ago, while alternative formats for music distribution like iTunes have grown more important. It is in times like these - when it is clear that the 'old' business model is no longer working - that business model experimentation becomes so important, but it is not at all clear what the eventual 'new' business model will turn out to be. Only experimentation can help identify it and create the data needed to justify it. In Radiohead's case, the experiment is widely considered to have been a success. The band's website registered over 3 million visits during the first 60 days after the release — while about 1/3 choose to pay nothing, the remaining 2/3 paid an average of £4. The net revenue to the band thus came in at around £2.67 pounds on average — far more than the band's share would have been under their normal business agreement.⁴

But here is where it gets interesting. 'In Rainbows' was then taken off the website, licensed to a publisher for sale in the US, UK and elsewhere and released through the regular commercial distribution channels. Even though it had been available for download for over 60 days at low prices (even for free), the CD debuted at #1 in both the US and the UK, and sold over 1.7 million CDs through commercial channels in the subsequent 21 months - 5–6 times more than Radiohead's earlier CDs. More than 100,000 collector box sets also were sold — a new revenue source for the band. Whatever revenue Radiohead might have lost through its initial download experiment was more than compensated for by the far greater publicity the band received, which seems to have accounted for the surge in commercial sales, and no doubt also benefited ticket sales for its subsequent world tour.

[Any] revenue the band lost in the download experiment was more than compensated by greater publicity and sales of the commercial [release] and tickets for its world tour.

A different business model experiment is under way in the pharmaceutical industry where — as in the music recording industry — the traditional business model is in real crisis. Fewer new chemical entities are being approved for sale, the FDA regulatory requirements remain challenging and R&D spending on new drug development is at an all time high. While it is clear that the ‘blockbuster’ business model era is over, what will replace it remains highly uncertain - again, this is exactly the time for business model experimentation. Johnson and Johnson’s experiment with Velcade - a drug for multiple myeloma, a form of bone cancer - involves J&J offering the drug to European health ministries with a novel proviso. If the drug is not efficacious in 90% of their patients, the ministries need not pay for it. (An alternative framing in the UK involves payment only where Velcade has proven efficacious.).

Barriers to business model innovation from previous academic research

It is too soon to know if J&J’s particular experiment will succeed or not. But it is quite timely to be trying such things in these industries where the extant business models are demonstrably broken. The question is: why don’t more organizations conduct such experiments, to probe for potential new business models *before* the time comes when external innovations render their traditional ones redundant?

The immediate answer is that businesses face significant barriers to business model experimentation, which previous academic research has helped to identify. One of the best such studies is by Amit and Zott.⁵ Choosing the business model as their unit of analysis, they identify novelty, lock-in complementarities and efficiency as key aspects of business model innovation. However, these may often conflict with the more traditional configurations of firm assets, whose managers are likely to resist experiments that might threaten their ongoing value to the company. A vice president of a field sales organization, for example, might take strong exception to experiments with online sales of the same products, whether they are successful or not.

While it was not as clear in his early work, Clayton Christensen’s concepts of ‘disruptive technology’ - and especially the later notion of ‘disruptive innovation’ - call attention to similar barriers to business model experimentation.⁶ What disrupts incumbent firms in Christensen’s story is not their inability to conceive of the disruptive technology: like Amit and Zott, he identifies the root of the tension in disruptive innovation as the conflict between the business model already established for the existing technology, and that which may be required to exploit the emerging, disruptive technology. Typically, the gross margins for the emerging one are initially far below those of the established technology. The end customers may differ, as may the necessary distribution channels. As the firm allocates its capital to the most profitable uses, the established technology will be disproportionately favored and the disruptive technology starved of resources. Christensen quotes Andy Grove, former CEO of Intel, ‘*Disruptive technologies is a misnomer. What it is, is trivial technology that screws up your business model.*’⁷

the root of tension [is] the conflict between the business model established for the existing technology, and that required to exploit the emerging, disruptive technology.

My work with Richard Rosenbloom has noted a different, cognitive barrier to business model experimentation not found in either Amit and Zott or Christensen, arguing that the success of established business models strongly influence the information that subsequently gets routed into or filtered out of corporate decision processes. This approach builds upon Prahalad and Bettis’ earlier notion of a ‘dominant logic’ of how the firm creates value and then captures value.⁸ Amid all the noise of daily business life, this logic aids the firm in assessing what information is important, and it will seek information that fits with this logic and eschew that which conflicts with it. This stance

helps organizations operate in otherwise chaotic environments, which are quite typical in early stage R&D, where both the technological potential and the market potential are highly uncertain. But that same dominant logic can act as is a double-edged sword with regard to business model experimentation - following it too slavishly can lead firms to risk missing potentially valuable uses of their technology when they do not fit obviously with their current business model.

So these accounts highlight different barriers: in Christensen, and in Amit and Zott, managers readily recognize the right business model, but its development is resisted due to its conflicts with the prevailing business model, or with the underlying configuration of assets that support that prevailing model. Our work, by contrast, has seemed to show that, in fact, it is far from clear to them even what the right business model ought to be. In either case - whether the barrier is confusion or obstruction - the way forward is via a commitment to experimentation. Undertaking active tests to probe nascent markets with new potential configurations of the elements of a business model can allow a firm to learn ahead of the rest of the market, and to begin to generate the new data that can power its change process. However, as we will see, experiments alone are not enough.

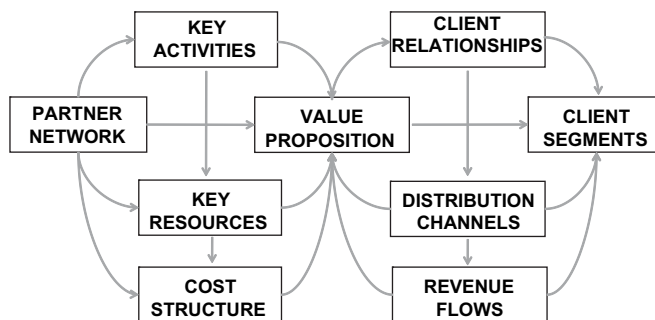
following 'dominant logic' can lead firms to miss potentially valuable uses of technology [which] do not fit their current business model.

Experimenting with and adopting new business models

If managers want to strive to overcome these barriers and experiment with alternative business models, how can they construct these experiments? One promising approach is to construct maps of business models, to clarify the processes underlying them, which then allows them to become a source of experiments considering alternate combinations of the processes. One example of this mapping approach has come from Alex Osterwalder who, following his dissertation at Lausanne, has consulted and spoken widely on business models and business model innovation.⁹ His empirical focus utilizes a 9 point decomposition that characterizes a business model, illustrated in Figure 1.

Another mapping approach comes from the concept of 'component business modelling'. IBM has been an early leader in this area, and has published white papers on the approach, and is even filing patents on the method. Figure 2 shows a visual depiction of IBM's view of a component business mode.

This modelling approach provides a pro-active way to actually experiment with alternative business models, by enabling firms to simulate various possibilities before committing to specific investments in reality. It also has the great virtue of explicitly visualizing the processes underlying a business model. Thus, theoretical considerations of configuring elements of a business model here can become far more concrete.



Source: <http://business-model-design.blogspot.com/2005/11/what-is-business-model.html>

Figure 1. Osterwalder's 9 point decomposition of a Business Model

	Business Administration	New Business Development	Relationship Management	Servicing and Sales	Product Fulfillment	Financial Control and Accounting
Direct	Business Planning	Sector Planning	Account Planning	Sales Planning	Fulfillment Planning	Portfolio Planning
Control	Business Unit Tracking	Sector Management	Relationship Management	Sales Management	Fulfillment Planning	Compliance Reconciliation
	Staff Appraisals	Product Management	Credit Assessment			
Execute	Staff Administration	Product Delivery	Credit Administration	Sales	Product Fulfillment	Customer Accounts
	Product Administration	Marketing Campaigns		Customer Dialogue	Document Management	General Ledger
				Contact Routing		

Source: <http://www.935.ibm.com/services/us/igs/cbm/html/cbmpage.html>

Figure 2. IBM'S Component Business Model

From maps to alternative business models: experimentation, effectuation, and organizational leadership

Tools such as mapping are useful to explicate business models, but cannot by themselves promote experimentation and innovation with those models. For that managers need organizational processes and enough authority to undertake the experiments, and then the ability to take actions based on results from those tests.

One set of processes relate to *experimentation*. Thomke provides a useful summary of principles and parameters for effective experimentation.¹⁰ While his concepts are focused on new product and process innovation, they apply equally to business models. An important principle concerns the fidelity of the experiment: the extent to which the experimental conditions are representative of the larger market. Trying out an alternative business model on real customers paying real money in real economic transactions provides the highest fidelity.¹¹ Important parameters include the cost of conducting the test, both in terms of the direct cost, and in the cost of failure if the experiment does not yield the hoped-for learning, the time required to obtain feedback from the experiment and the amount of information learned from the test. Here Thomke is clear about distinguishing 'failures' from 'mistakes': the former are a natural outcome of the experimentation process and can be quite useful; the latter are experiments that are too poorly designed to yield any new learning. So companies should strive to develop processes that provide high fidelity as quickly and cheaply as possible, aiming to gain cumulative learning from (perhaps) a series of 'failures' before discovering a viable alternative business models.

McGrath and Macmillan's concept of discovery-driven planning (the methodology is described elsewhere in this issue) figures in here as well.¹² The method has the important ability to model unknown assumptions so that they can be directly tested, and to clarify the required results of experiments to arrive at an economically attractive business model. Most economic justifications for new innovative spending presume answers to as yet unknown questions. Discovery-driven planning enables the company to evaluate the key economic assumptions explicitly, which can then be updated as the results of further experiments become known.

A second set of processes relate to what Sarasvathy calls *effectuation*, a term that is the opposite of causation and derives from Simon's work on the science of the artificial.¹³ In effectuation processes, actors (such as firms or entrepreneurs that create new businesses - and associated business models) do not analyze their environment so much as take actions that create new information that reveals

latent possibilities in that environment. In other words, they do not study the market so much as *enact* it. There is a strong bias in effectuation for action over analysis, because there may be insufficient data available to analyze one's way towards a new business model: without action, no new data will be forthcoming.

There is a strong bias in effectuation for action over analysis ... [where] there is insufficient data ... firms do not study the market - they enact it.

Such action is particularly critical for the cognitive act of reframing the dominant logic of one's business model. Emergent opportunities typically lack the deep wealth of data that are used to justify corporate actions in the mainstream business. Indeed, it is only through taking experimental actions that new data will be generated. Mapping tools can again be quite helpful here - by providing depictions of both current and prospective business models, managers can quickly surmise many of the likely implications of making such a change. Such tools can also assist in characterizing and communicating new cognitive models effectively to others.

A third process that is vital for changing the business models of already existing organizations is that of leading change in the organization. This can be a puzzle - who is responsible for business model experimentation? Functional heads will lack authority over the whole organization: but business models will require testing aspects of and interactions between operations, engineering, marketing, sales and finance and (as we have already seen) business model experimentation may well involve conflicts with some or all of these functions.

CEOs of small companies may be ideally suited to the task, especially if they are also owners of the business. However, a real problem with relying upon the CEO to lead change is that they likely rose to their position via the current business model, which is now deeply familiar - even comforting - while potential alternative models will be unfamiliar and may even seem threatening. Thus - although in the best position to lead it - the CEO may actually act in ways that retard the experimentation process. Another possible locus of business model innovation could be the general managers of specific businesses in larger firms. But while these managers may have the authority, they are typically rotated from one position to another every 2-3 years, which may be too little time to formulate the experiments, conduct them, collect the data, analyze the data, develop inferences and interpretations of that data, and then reframe the analysis in ways that are sufficiently persuasive to guide the transformation to a new business model.¹⁴

Doz and Kosenen discuss in this issue the need for firms to have strategic agility if they are to be able to transform their business models in the pursuit of strategic innovation. This demands leadership meta-skills in perceptions of the environment, in maintaining unity among the leadership team, and in the ability to reallocate resources to support new models.¹⁵ This bears a close resemblance to the idea of organizational ambidexterity also advocated by Tushman and O'Reilly,¹⁶ although neither conception sufficiently considers the ability of middle managers to shape the strategic agenda, as shown in Burgelman's research.

Both conceptions also note the problems involved in organizations needing to continue to perform well in their current business (and business model), while at the same time undertaking the experiments necessary to nurture a new model. Indeed, this is part of the organizational problem, as the search for a new business model often requires an extended period of co-existence between the current and new models. Knowing when to shift resources from the former to the latter is a delicate balancing act, and rife with possible career consequences for the managers involved. It takes a strong organizational culture to navigate through these treacherous shoals, so that the local objectives of individual middle managers give way to the imperatives of the larger whole.

the search for a new business model [may mean] extended co-existence between current and new models. Knowing when to shift resources [towards] the latter is a delicate balancing act

Organizations must address these leadership issues to ensure effective governance of business model experimentation, and that the results of their experiments lead on to action within the organization. As we have seen from the academic literature, there are powerful barriers to business model innovation, but the way forward is for leaders to adopt, explicitly, an experimental stance toward business model innovation. Leaders can authorize the launch of high fidelity, low cost, quick performing and usefully informative experiments. These new data will be reflected in new discovery driven models, and leaders must be empowered to take action based on these findings, and overcome the barriers that surround and protect the extant business model. The leadership process must address the many affected constituencies within the organization without becoming mired in the infighting between them. To quote an old aphorism, ‘*In God we trust, all others bring data*’ and: it is the experimental process that can bring that data to bear.

Conclusion

In sum, business model innovation is vitally important, and yet very difficult to achieve. The barriers to changing the business model are real, and tools such as maps are helpful, but not enough. Organizational processes must also change (and these are *not* mapped by those tools). Companies must adopt an effectual attitude toward business model experimentation. Some experiments will fail, but so long as failure informs new approaches and understanding within the constraints of affordable loss, this is to be expected - even encouraged. With discovery driven planning, companies can model the uncertainties, and update their financial projections as their experiments create new data. Effectuation creates actions based on the initial results of experiments, generating new data which may point towards previously latent opportunity.

And organizations will need to identify internal leaders for business model change, in order to manage the results of these processes and deliver a new, better business model for the company. The discretion and judgment of middle managers must be subjected to empirical data if local objectives are to be subordinated to those of the overall organization. At the same time, the organization’s culture must find ways to embrace the new model, while maintaining the effectiveness of the current business model until the new one is ready to take over completely. Only in this way can business model innovation help companies escape the ‘trap’ of their earlier business models, and renew growth and profits.

business model innovation is vital, yet very difficult ... the barriers to change are real. [Model] experiments will fail, but [if] they inform new approaches and understanding, this is to be expected - even encouraged.

Acknowledgements

I am indebted to Simon Wakeman, for able research assistance, as well as to David Teece, and Patrick Sullivan of ICMG for thoughtful comments and discussion. I have also received thoughtful comments from the special issue editors, Charles Baden-Fuller and Ian Macmillan — and I thank them for the invitation to contribute - and patient editing guidance from Jon Morgan.

References

1. H. Chesbrough and R. S. Rosenbloom, The role of the business model in capturing value from innovation: evidence from xerox corporation's technology spin-off companies, *Industrial and Corporate Change* 11(3), 529 (2002); This definition is utilized in a number of contexts in H. Chesbrough, *Open Innovation: The New Imperative for Creating and Profiting from Technology*, Harvard Business School Press, Cambridge, MA (2003); and also in H. Chesbrough *Open Business Models: How to Thrive in the New Innovation Landscape*, Harvard Business School Press, Cambridge, MA (2006).
2. D. Kearns and D. Nadler, *Prophets in the Dark: How Xerox Reinvented Itself and Beat Back the Japanese*, Harper Business, New York, NY (1992) p. 88. See also Y. Doz and M. Kosenen, Embedding strategic agility: A leadership agenda for accelerating business model renewal, *Long Range Planning* 43(2–3), 370–382 (2010), who observe that what help Xerox did obtain in the low end of the copier market largely came through Fuji-Xerox, its joint venture with Fuji in Japan.
3. This protocol soon became industry standard - IEEE 802 which published the protocols so that numerous companies could incorporate them into their products and services.
4. The commercial sales data are made more impressive by the reported additional 2.3 million illegal downloads taken of the tracks while they were on the site: see <http://www.independent.co.uk/arts-entertainment/music/news/radiohead-sales-show-fans-loyalty-to-illegal-sites-884239.html>.
5. R. Amit and C. Zott, Value creation in e-business, *Strategic Management Journal* 22, 493–520 (2001).
6. C. Christensen, *The Innovator's Dilemma*, Harvard Business School Press, Cambridge, MA (1997); C. Christensen and M. Raynor, *The Innovator's Solution*, Harvard Business School Press, Cambridge, MA (2003).
7. This quote is taken from Christensen's course review slides for his Harvard Business School class, *Building Sustainably Successful Enterprises*, at HBS, December 2002.
8. C. K. Prahalad and R. Bettis, The dominant logic: retrospective and extension, *Strategic Management Journal* 16(1), 5–14 (1995).
9. A. Osterwalder, *The Business Model Ontology: A Proposition in the Design Science Approach*, unpublished dissertation, University of Lausanne (2004).
10. S. Thomke, *Experimentation Matters*, Harvard Business School Press, Cambridge, MA (2002).
11. This is one reason why startup companies may yield important insights into new business models - they are, in effect, 'experiments' with real companies making real products selling to real customers.
12. R. G. McGrath and I. C. Macmillan, Discovery driven planning, *Harvard Business Review* 73(4), 44–54 (1995).
13. S. Sarasvathy, *Effectuation*, Edward Elgar, London, UK (2008); H. Simon, *The Sciences of the Artificial* (3rd edn), MIT Press, Cambridge, MA (1996).
14. R. Burgelman, A process model of internal corporate venturing in the diversified major firm, *Administrative Science Quarterly* 28(2), 223–244 (1983).
15. Y. L. Doz and M. Kosenen (2009) op. cit at Ref 2.
16. M. Tushman and C. O'Reilly, Ambidextrous organizations: managing evolutionary and revolutionary change, *California Management Review* 38(4), 8–30 (1996).

Biography

Henry Chesbrough is Executive Director of the Center for Open Innovation and Adjunct Professor at the Haas School of Business at UC Berkeley. Previously he taught for six years at Harvard Business School and, before academia, spent ten years with Silicon Valley companies. His research focuses on managing technology and innovation. His academic work has been published widely in major journals, and he has authored more than 20 case studies on companies in the IT and life sciences sectors. His 2003 book, *Open Innovation* was a Strategy + Business magazine 'Best Business Book', while his most recent book, *Open Business Models* (2006) extends his analysis of innovation to business models, intellectual property management, and markets for innovation. He is a member of the Editorial Boards of Research Policy and the California Management Review. *Center for Open Innovation, F402 Haas School of Business, University of California-Berkeley, CA 94720-1930. Tel +1-510-643-2067; E-mail: chesbrou@haas.berkeley.edu*