
D

Decentralization

Gerrit Broekstra
Erasmus University, Rotterdam, The Netherlands

Abstract

Application of Ackoff's typology of systems to the concept of decentralization shows that at least two types of decentralization can be distinguished. Decentralization 1.0 is the well-known traditional type developed in the context of the classical command-and-control paradigm, and has a top-down character. By contrast, Decentralization 2.0 evolves from a different set of basic assumptions and values, the enabling-and-autonomy paradigm, which is more bottom-up oriented. The Law of Requisite Variety irrefutably stipulates that in order to cope with increasing environmental chaos and complexity, corporations must evolve towards higher-variety organizational forms characterized by this different type of decentralization. History has shown that early adopters of a new decentralization concept have often reaped enormous benefits.

Definition Decentralization indicates the extent to which decision-making power is dispersed among the members of an organization, away from the centre – the strategic apex of an organizational hierarchy. Its opposite is centralization, where power and authority are concentrated at the centre.

Decentralization is in the air, both in the private and public sector, but it remains an elusive, if not confusing concept. It can only be properly understood by taking into account the underlying tacit conceptualization of the organizational form with which it is associated. Paleontologists Eldredge and Gould have shown that the evolution of biological life proceeds only sporadically: 'long periods of no change – equilibria – are "punctuated" by episodes of revolutionary activity', eventually, by the power of natural selection, locking in on particular forms (Eldredge 1999: 141). As a law of organizational nature, it appears that, though on a much faster scale, the forms that organizational life takes similarly evolve in fits and starts separated by relatively long periods of stability locked in on a dominant organizational form (Broekstra 2002). The concept of decentralization offers a remarkably sharp lens through which we can bring into focus this punctuated evolution of organizational forms. To see this more clearly, it is important to know how we conceptualize our organizations. This view largely determines how they decide and what they do.

A useful classification of types of conceptualization turns out to be the typology of systems conceived by the innovative organizational thinker Russell Ackoff (1994, 1999). The critical classifying variable in Ackoff's typology is *purpose* – whether the whole and the parts have or do not have a purpose. A purposeful entity is defined as possessing the ability to exercise *choice*

Decentralization, Table 1 Application of Ackoff’s typology of systems to the study of decentralization

| | Whole | |
|----------------|--|---|
| | Not purposeful | Purposeful |
| Not purposeful | 1. <i>Mechanistic system Centralization</i> (Bureaucracy) | 2. <i>Organismic system Decentralization 1.0</i> (Organizations with divisions, business units) |
| Parts | | |
| Purposeful | 4. <i>Ecological system Decentralization 3.0?</i> (Business ecosystems; egalitarian ‘reverse dominance hierarchies’) | 3. <i>Social system Decentralization 2.0</i> (Autonomous units + enabling organization) |

of both ends (desired outcomes) and means (courses of action) in two or more environments. Since environmental complexity is the driving force behind the evolution of organizational forms, an additional feature of the typology is that the consecutive classes of systems display increasingly higher levels of variety, which are required to cope with the corresponding higher levels of complexity (see Table 1; Broekstra 2014). This is entirely in accordance with Ashby’s (1956) well-known Law of Requisite Variety (variety is a measure of complexity). The law states that only variety (of organization behaviours) can absorb variety (of the environment).

Organizations as Machines: Centralization

Under the sway of the Newtonian worldview of the universe as a deterministic, predictable clock-work mechanism, the dominant conceptualization, originating in the Industrial Revolution, was of the organization as a smooth-running machine. A mechanistic system has no purpose of its own, but it does have one or more functions. Its main function is to serve the purposes of its owners, who believe that making a profit is the only legitimate function of an enterprise – many still do. The parts of the organization, the individual employees, are thought of as having no purpose of their own. Relatively uneducated workers were considered replaceable parts of the machine, who worked most efficiently when they were involved in simple, repetitive and highly standardized tasks, requiring a minimum of skills and training. The ensuing rationalized hierarchy is

characterized by a sharp division of labour, functional specialization, extensive rules and procedures, standardization, a hierarchy of authority and control and centralized decision-making. A sharp dichotomy exists between the formulation (at the strategic apex) and the implementation (middle management and operating core) of strategy. The inevitable result is, as Mintzberg (1983: 167) notes, ‘a structure with an obsession – namely, control’. It is to be noted that the rationalization of society as observed by Max Weber (1947) enhanced the proliferation of these centralized command-and-control bureaucracies. However, it can only function efficiently in a relatively simple, stable and controlled environment.

The pioneers of the large-scale centralized and functionally specialized business organizations were the emerging railway companies in the nineteenth century. In their wake, and reinforcing each other, they were also typically found in the large mass-production and distribution firms. Not that there had not been a viable alternative for the centralized business enterprise. Under the charismatic leadership of J. Edgar Thomson, the Pennsylvania Railroad Company developed in the mid-nineteenth century as a geographically diversified and decentralized multidivisional organization, which, for a long time, was the largest organization in the world (Pennsylvania Railroad 1858; Broekstra 2014). It was widely acclaimed as the most innovative, best-run and most profitable railway. Nevertheless, mainly under the influence of control-minded bankers, the centralized functional form became the dominant design of organizational life roughly from the mid-nineteenth to the mid-twentieth century

(Chandler 1977). Such is the inscrutable mechanism of punctuated evolution, which often appears to lock in on a design that is far from superior.

Organizations as Organisms: Decentralization 1.0

In the second half of the twentieth century, the organismic view of organizations widely emerged as a response to the increasing pressures and variety amplification from the organizational environment. It originates from the biological Darwinian worldview of survival of the fittest. Peter Drucker (1980: 7) popularized the notion of environmental *turbulence* to indicate the rising complexity and rate of change, where the ‘first task of management is to make sure of the institution’s capacity for survival’.

Ackoff points out that in an organismically conceived organization two main parts can be distinguished: (1) top management, the purposeful brain; and (2) the operating core, the purposeless body. At the human level, human beings are purposeful organisms, and thus have the ability to choose both ends and means. Their parts, that is, their organs, perform certain functions in the whole and are necessary for its survival, but have no purposes of their own – fortunately. At the organizational level, the parts – which may be divisions or business units – are granted greater autonomy and control over operating functions, which implies a greater variety of choices as to the means, but not to the ends (objectives or goals). These are basically established by top management. Drucker (1972: 58) puts it succinctly: ‘central management refrains as much as possible from telling a division how to do its job; it only lays down what to do’. Therefore, these parts are not purposeful, but can be called goal-seeking. They are assigned a manageable chunk of the total environmental variety, represented by market diversity, which may be product/service, and/or geography.

Around the time of the sharp recession of the 1920s, a famous early adopter of the organismic view was the American chemical company Du

Pont. Earlier on it had transformed itself from a loose agglomeration of many relatively small firms into a highly centralized, vertically integrated, functionally departmentalized structure – Ackoff’s type one – with a single line of products: explosives. After a phenomenal expansion during the First World War, the company was faced with the threat of excess capacity. The strategic response was product diversification. With all the problems and conflicts bubbling upwards, the centralized functional structure started to burst at its seams. Eventually, after much resistance from senior management, a revolutionary decentralized corporate form evolved, the multidivisional form – also called the M-form – with ‘autonomous, multi-departmental divisions and a general office with staff specialists and general executives’ (Chandler 1962: 111) – Ackoff’s type two.

When the automobile market collapsed in 1920, to meet the crisis General Motors quickly followed a different evolutionary trajectory. It adopted Alfred Sloan’s (1963) plan to centralize what was basically an agglomeration of many autonomous operating units – ‘an anarchical decentralization’ – into a similar M-form structure (Chandler 1962: 133). Like at Du Pont, this early transformation to a decentralized divisional form in response to rising environmental complexity gave GM a competitive advantage for decades. Drucker (1972: 50), in his famed study of General Motors, extensively discusses its decentralization, which he saw not as ‘a mere management technique, but as an outline of a social order’. Not until after the Second World War, with the onset of a diversification wave, did other large companies start to adopt the divisional form, and it become the dominant social order in many industries. Although, compared with the functional structure, central command may have been mitigated somewhat in these ► [M-form firms](#), control of the quasi-autonomous divisions was definitively reinforced (Mintzberg 1983). Control drives out trust and, for that matter, innovation and entrepreneurship. Furthermore, since some strategic decision-making power is obviously retained centrally at the top, such decentralization is always to some extent *selective decentralization*.

As a result, in the divisional form centralization and decentralization do a continuous dance. Though better able to handle the perceived environmental turbulence, like the functional form, the divisional form is still invariably ruled by the basic assumptions, values and beliefs of the command-and-control paradigm.

Organizations as Social Systems: Decentralization 2.0

Being aware of, on the one hand, people's vastly improved levels of health and education, their expectations of living a fuller life and having meaningful jobs, their drastically changed attitudes towards power and authority, and, on the other hand, the corporation's own compelling entrepreneurial needs in a fast and volatile, information-driven, high-variety global economy, in the third type, the organization as a social system, people are at last recognized for what they are: purposeful beings, that is, able to select both means and ends. (Note that a 'social system' is just a technical term to indicate systems or wholes in which people individually and collectively play the major roles.) Ackoff (1994: 31) observes that social-systemic organizations 'should enable its parts and its containing systems to do things they could not otherwise do. They enable their parts to participate directly or indirectly in the selection of both ends and means.'

Particularly innovative firms are thriving on the use of their employees' full potential. They search for ways to act more in accordance with the creativity of human nature, and for forms which act as inspiring communities of people. This resonates with Mintzberg's (2009) call for rebuilding companies as (moral) communities. Since choice of ends and means is essential for purposeful behaviour, and to achieve higher levels of requisite variety, Ackoff argues that the parts of the system must be granted far more freedom of choice and action, that is, become more truly autonomous. This entails a different kind of decentralization in organizations that have variously been called 'radically', 'strongly' or 'highly' decentralized. Significantly, managers

are supposed to let go of their 'control-oriented role' and adopt 'a more supportive coaching-based' one (Ghoshal and Bartlett 1997: 61).

More often than not, the alleged radical decentralization turns out to be one that does reach deeper into the structure to create smaller organizational units like profit centres meant to kindle the entrepreneurial spirit, but, upon closer examination, 'ends' in terms of performance criteria and goals are still being imposed on these units from above. While middle management above the front-line operating units finds it difficult to abandon their ingrained control mentality, top management continues to play the strategy game – strategic planning, budgeting, financial control, divesting and acquiring companies to stimulate growth. What happens then is that the logic of hierarchy (and control) collides with the logic of autonomy. This is exactly what happened in the 1960s and 1970s when autonomous groups and self-managing teams became popular, but the rest of the hierarchy continued to operate under the command-and-control mode. As a result, these early experiments with bottom-up decentralization were encapsulated and eventually aborted. The even deeper penetrating 'radical' decentralization can rightly be called an instance of Decentralization 1.0.

In contrast, Decentralization 2.0 does not operate under some variant of the classic command-and-control paradigm, but arguably under a fundamentally different, emerging paradigm. This I have dubbed the enabling-and-autonomy paradigm (Broekstra 2014). The key criterion for an organization to be a high-variety, purposeful social system, as formulated a long time ago by Ackoff and Emery (1972), is the concept of *instrumentality*, briefly: either the parts are instrumental for and serve the whole – which decreases overall variety – or the whole is instrumental for and serves the parts – which increases variety – and *enables* them to be purposeful, truly *autonomous* units. In the evolution of organizational forms, the latter is a veritable punctuation, and implies a fundamental reconceptualization and reorganization of the whole firm as a social system.

A striking case in point is the far-reaching decentralization within the context of a

social-systemic reconceptualization and reorganization, in 1970, of the then highly centralized Sweden-based, century-old Handelsbanken, when it emerged from a crisis under the new leadership of Jan Wallander (2003). His ‘common-sense approach’ and egalitarian belief in working with rather than against human nature led him to strongly decentralize the company. The branch offices gained a high degree of autonomy in their local markets to make all important decisions required to fully serve both private and (large) corporate customers – ‘the branch is the Bank’ (a simple, crystalline, but powerful strategic concept guiding all actions, that Collins (2001) would call a *Hedgehog Concept*). At the same time, large head office departments such as strategic planning and budgeting – ‘an unnecessary evil’ – marketing, and personnel were dismantled; a dazzling memo-culture and a Byzantine network of committees were abruptly stopped, and so forth. Furthermore, a time-consuming process of reversing the attitudes of management 180° was initiated. Until today the full-service bank works without budgets, centrally imposed sales targets, or traditional marketing and advertising. Between the CEO and the branch manager is one level, the regional bank, of which there are 15 in its 6 home markets. The whole high-variety organization is geared to enable the branches (average number of employees is 8) to fully exploit their autonomy and focus on creating long-term value for their customers. In 2014 the bank employed about 11,600 employees in over 820 branches worldwide – about 45% outside Sweden – but mostly in its home markets, the three Scandinavian countries, Finland, the United Kingdom and the Netherlands.

At a time when the banking environment is characterized by crisis and alarmingly low trust, Handelsbanken thrives on a distinctive internal climate of trust and shared values which acts as the glue that keeps the organization together, indeed, makes it into a moral community of people. This radiates outwards to the customer. The power of its moral or genetic code, the ‘Handelsbanken Way’, replaces that of the traditional hierarchical authority. Leadership has become a distributed property within the

organization. Strategy is no longer formulated at the top and implemented at the bottom, but is characterized more by a grass-roots, outside-in *formation* process (Mintzberg 1987). Through a characteristic ownership structure – a unique profit-sharing foundation makes employees shareholders of the company and 2 out of 11 members of the Board of Directors are employee-representatives of the foundation – and a long-term approach, the bank keeps growing, mostly organically, ‘branch by branch, customer by customer’.

For over 40 years, the bank’s performance record has consistently been quite remarkable in terms of high customer and employee satisfaction, and higher profitability than its competitors. Bloomberg ranked Handelsbanken as one of the world’s strongest banks – and the strongest bank in Europe. Somewhat oversimplified, but clearly powerfully suggestive is the cause–effect relationship of high trust yielding high performance. The organization of the bank is a good example of the enabling-and-autonomy paradigm as it is embodied in this new type of social-systemic decentralization, Decentralization 2.0. It may be noted that, for obvious reasons, still under the strict assumption of directly serving and supporting the autonomous units, some *selective centralization* may occur. For example, at Handelsbanken the capital markets function (investment bank and asset management) is centralized (a case study of Handelsbanken and other examples can be found in Broekstra 2014).

Organizations as Ecological Systems: Decentralization 3.0?

In the fourth cell of Ackoff’s matrix the ‘organization’ no longer has a power centre. There exists a whole, called an ecological system, which has no purpose of its own. Since this is the subject of study of complexity science, an alternative name would be a complex, adaptive system. The parts – autonomous agents – are interrelated through their interactions, and have purposes of their own. An ecological system serves the purposes of its mechanistic, organismic and

social-systemic parts. Service and support are its functions (Ackoff 1999). Therefore, in the lower half of the matrix, type three and type four systems reside in the enabling-and-autonomy paradigm, just like in the upper half type one and two reside in the control- and-command paradigm.

Decentralization 3.0 could be viewed as equivalent to the concept of egalitarianism. An alluring example would be the organization of some highly evolved ant colonies, were it not that individual ants are commonly not considered to be purposeful beings. Nonetheless, without any leadership or management whatsoever, through ‘the invisible hand’ of self-organization, cooperating ants are able to achieve awe-inspiring nest constructions and remarkable ways of living. Another example is a business ecosystem as defined by Moore (1996). Individual businesses, customers and suppliers are all interacting on an equal footing (note that cartels are illegal) and coevolve their capabilities and roles through the mechanisms of self-organization and emergence.

Finally, since understanding human (political) nature is highly pertinent to comprehending the evolution of decentralization, we should not forget that for millions of years we have lived in nomadic bands and tribes of hunter-gatherers which were dominated by an egalitarian ethos. For survival reasons, we cherished our personal freedom, vigilantly insisted on our individual autonomy and did not allow any would-be leaders to emerge who threatened them by bossing us around. Boehm (2001: 105), who intensively studied the evolution of egalitarian behaviour, points out that we appear to have a rather ambivalent political nature which is succinctly explained as ‘all men seek to rule, but if they cannot rule they prefer to be equal’. The egalitarian ethos of bands and tribes works out in what Boehm calls a ‘reverse dominance hierarchy’, with the subordinates firmly in charge such that ‘it is the rank and file who are on top, and the would-be alphas who remain under their thumbs’.

Boehm (2001: 65) also remarks that ‘one of the great mysteries of social evolution is the transition from egalitarian society to hierarchical society’. The punctuated evolution of progressive decentralization in corporations, as discussed above,

may show a reversal of this trend. It would foster a mentality of organizing with, rather than against, our deeply ingrained human nature to act for the benefit of all. Although, admittedly, an interesting point of reference, whether type four fully egalitarian business firms, conceptualized as complex adaptive systems, ever result in some new dominant organizational form, is as yet mere speculation.

See Also

► [M-Form Firms](#)

References

- Ackoff, R.L. 1994. *The democratic corporation*. New York: Oxford University Press.
- Ackoff, R.L. 1999. *Re-creating the corporation: A design of organizations for the 21st century*. New York: Oxford University Press.
- Ackoff, R.L., and F.E. Emery. 1972. *On purposeful systems*. Chicago: Aldine-Atherton.
- Ashby, R.W. 1956. *An introduction to cybernetics*. London: Chapman & Hall.
- Boehm, C. 2001. *Hierarchy in the forest: The evolution of egalitarian behavior*. Cambridge, MA: Harvard University Press.
- Broekstra, G. 2002. A synergetics approach to disruptive innovation. *Kybernetes: The International Journal of Systems & Cybernetics* 31: 1249–1259.
- Broekstra, G. 2014. *Building high-performance, high-trust organizations: Decentralization 2.0*. London: Palgrave Macmillan.
- Chandler Jr., A.D. 1962. *Strategy and structure: Chapters in the history of the industrial enterprise*. Cambridge, MA: The MIT Press.
- Chandler Jr., A.D. 1977. *The visible hand: The managerial revolution in American business*. Cambridge, MA: The Belknap Press of Harvard University Press.
- Collins, J. 2001. *Good to great: Why some companies make the leap . . . others don't*. New York: HarperCollins.
- Drucker, P.F. 1980. *Managing in turbulent times*. London: William Heinemann.
- Drucker, P. F. [1946] 1972. *Concept of the corporation*. New York: New American Library.
- Eldredge, N. 1999. *The pattern of evolution*. New York: Freeman and Company.
- Ghoshal, S., and C.A. Bartlett. 1997. *The individualized corporation: A fundamentally new approach to management*. New York: HarperCollins.
- Mintzberg, H. 1983. *Structure in fives: Designing effective organizations*. Englewood Cliffs: Prentice Hall.

- Mintzberg, H. 1987. Crafting strategy. *Harvard Business Review* 65: 66–75.
- Mintzberg, H. 2009. Rebuilding companies as communities. *Harvard Business Review*, July–August, 1–5.
- Moore, J.F. 1996. *The death of competition: Leadership and strategy in the age of business ecosystems*. Chichester: Wiley.
- Pennsylvania Railroad. 1858. *Organization for conducting the business of the road, adopted December 26, 1857*. Philadelphia: Crissy & Markley Printers.
- Sloan Jr., A.P. 1963. *My years with general motors*. New York: Doubleday & Company.
- Wallander, J. 2003. *Decentralization – Why and how to make it work: The Handelsbanken way*. Stockholm: SNS Förlag.
- Weber, M. 1947. *The theory of social and economic organization*. London: Oxford University Press.

Decision-Making

Paul J. H. Schoemaker¹ and J. Edward Russo²

¹University of Pennsylvania, Wharton School of Business, Philadelphia, PA, USA

²Cornell University, Samuel Curtis Johnson Graduate School of Management, Ithaca, NY, USA

Abstract

This entry aims to connect behavioural research on decision-making over a number of decades to the field of strategic management. This intersection has not been as fully developed as it could be and hence presents rich opportunities for improving strategic decision-making in and by organizations. We shall cover both individual and organizational findings using our four-phased decision framework (Russo, J.E., and Schoemaker, P.J.H. *Winning decisions: Getting it right the first time*. New York: Doubleday, 2002), with special links to the domain of strategic decisions. These include corporate strategic choices as well as adopting a strategic approach to making tactical and even operational decisions in organizations.

Definition Decision-making is the process whereby an individual, group or organization reaches conclusions about what future actions to

pursue given a set of objectives and limits on available resources. This process will be often iterative, involving issue-framing, intelligence-gathering, coming to conclusions and learning from experience.

Multiple views exist about strategic decision-making in complex firms, from rational, top-down perspectives to incremental and power-based ones (see Schoemaker 1993). The rational unitary actor model posits that organizations carefully scan their environment and objectively match external opportunities with internal strengths. By contrast, the organizational view emphasizes that even though these may be the intentions of individual actors, the design of the organization (in terms of structure and process) greatly influences what is perceived, encoded and acted upon. The political view especially questions the intended collective rationality of organizational actors and frames them as coalitional in nature. Stronger groups will often enhance their power and interests at the expense of the minority or even the firm's overall well-being (Allison 1971). Lastly, some scholars view the organization as entangled in its own inner complexity, with limited coping routines and a high degree of context-sensitivity. The garbage can model (Cohen et al. 1972) posits that what happens and why in organizations depends greatly on the vagaries of the moment, that is to say the actors involved, the timing of the decision, hidden agendas, information flows and other details in the mosaic of organizational life.

As firms become large and highly structured, they must manage increasingly complex decision processes, which may strain the adequacy of the heuristics employed to achieve approximate rationality. Complexity often creates unwelcome biases in the decision-making process. A well-known example is the sunk cost fallacy and the related phenomenon of escalating commitment to existing courses of action (Schultze et al. 2012). Psychologically, losses – especially those that are quantified and recorded such as write-offs of major investments – loom larger than comparable gains or opportunity costs (Kahneman and Tversky 1979). Also, as firms grow, strategic

decisions are more likely to encounter internal political and organizational constraints that exclude creative perspectives while highlighting more routine ones. For example, the relevant competitors may be defined as just domestic ones (as the car makers in Detroit once did). Or the time frame may be limited to just 5 years (when examining future technological trends). Furthermore, which committee will evaluate various investments, in what sequence and at what time may matter greatly (Bower 1971).

Cognitive Biases

The remainder of this entry will focus on cognitive sources of poor decision-making, while fully recognizing that many emotional factors influence the decision process as well (Kets de Vries and Miller 1987; Weber and Johnson 2009). We view the decision process as consisting of four key phases: (1) framing, (2) intelligence-gathering, (3) choice and (4) learning from feedback. In addition, there is the important meta-decision stage. It overarches the four phases just mentioned, posing such questions as: (i) are we solving the right problem, (ii) who should be involved in the decision and (iii) which of the above four phase(s) deserves the most attention? Figure 1 charts this model of decision-making based on Russo and Schoemaker (2002). The accounting and finance functions are traditionally strong in addressing the choice or ranking phase, while

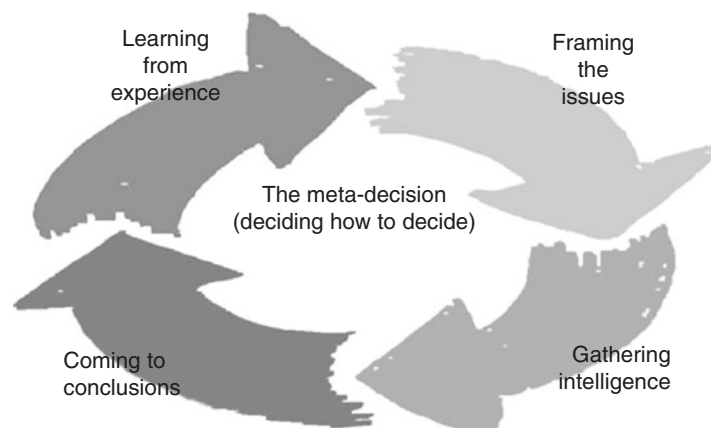
leaving idea generation and framing more to other disciplines and functions, such as marketing and strategy.

Framing

It is useful to distinguish between decision frames and thinking frames. Decision frames define the acts, contingencies and outcomes as perceived by the decision maker (Tversky and Kahneman 1986). Thinking frames concern the deeper cognitive structures, such as knowledge bases, scripts, schemata, cognitive maps and inference mechanisms that shape the decision frame. Key aspects of the decision frame are its boundaries (for example, region, time and market scope), reference points (for instance, required rates of returns, performance benchmarks, relevant competitors) and metrics (such as return on investment, market share and measures of product quality).

Many firms use their own past performance, or that of close competitors, as the relevant reference point for judging their success. Such myopic framing plagued much UK industry in the 1970s as well as the automobile manufacturers in Detroit. A more subtle framing issue in new technology decisions concerns the 'don't invest' option, which often assumes a continuation of current trends as its reference point (Kaplan 1986). This static view, however, ignores the actions of competitors which will likely erode the status quo. Game theory, as well as shifting

Decision-Making,
Fig. 1 Phases of the
decision process



Source: Russo and Schoemaker (2002)

the metaphor (e.g., towards biological evolution), can help challenge such myopic frames. The failure to adopt a portfolio perspective is another notable framing bias of the behavioural decision literature (see Thaler 1980); each decision is addressed in isolation of others.

Intelligence-Gathering

Primary biases in this phase are (1) the tendency towards ► **overconfidence**, (2) reliance on flawed heuristics in estimation and (3) a preference for confirming over disconfirming evidence. Overconfidence or hubris reflects poor secondary knowledge, that is not knowing what we don't know (Kahneman et al. 1982; Klayman et al. 1999). This can be partly cured through repeated feedback (e.g., in weather forecasting and bridge) or attempts to challenge key premises via reason generation, fault trees or scenario construction (Russo and Schoemaker 1992). The overconfidence bias is especially likely to plague decisions for which little data exist and in which judgement must necessarily play a major role. The key is to know when to distrust one's intuitions and how to bring key assumptions to the surface (Mason and Mitroff 1981), especially in small groups (Janis 1982).

Reliance on heuristics (that is, short-cuts that simplify complex judgements) is unavoidable in many cases. For instance, future market share or interest rates may be predicted from current values. However, often such anchors drag the judgement, resulting in an underestimation of change (Tversky and Kahneman 1974) and hence conservatism. In stable times, managerial heuristics (in such areas as pricing, hiring, forecasting) often strike an efficient balance between accuracy and information-processing cost. During periods of discontinuity, many established rules of thumb become outdated and dangerous when accepted as truth. Thus, firms may be burdened with inappropriate mental software when exploring the promises and pitfalls of new investments (Schoemaker 1990).

Out-of-date heuristics may persist because of the third bias mentioned: the failure to search for

disconfirming evidence. Managers seldom approach their inference- and hypothesis-testing tasks with a mindset aimed at disproving received wisdom. Aversion to contrary evidence and institutionalized filtering reinforce old beliefs and habits. Often, a new generation of managers or successful start-up competitors are needed before adaptation to changing circumstances can occur.

Choice

Of the four phases of decision-making, choice may be on the firmest analytic ground. Net present value (NPV) analysis imposes considerable discipline on calculations that would otherwise overwhelm human intuition. Nonetheless, this tool requires unbiased inputs to yield its supposed benefits. Much of finance theory addresses how to set the discount rate to reflect a project's cost of capital and systematic risk, but offers little guidance on how to estimate cash flows or the value of downstream options. In addition, the problem may not be just the valuation of alternatives explicitly considered, but restricting the firm unduly to a narrow set of innovation options. Numerous informal choices are made along the convoluted path of project idea to formal evaluation, both individually and in small groups.

One factor especially complicates strategic choices, namely people's natural aversion to ambiguity. In rational models of choice, ambiguity should not matter. Uncertainty (in the sense of second-order probability distributions) and even ambiguity (in the sense of ill-defined probability distributions) is ignored by *integrating* over a presumed subjective probability distribution – defined on the target probability. Behaviourally, however, people tend to prefer a known probability over an unknown one of equal mathematical expectation (Ellsberg 1961; Einhorn and Hogarth 1986). Thus, projects entailing high ambiguity – stemming from either technological or market uncertainties – are likely to be systematically undervalued in people's informal screening of projects. In addition, the customary insistence of large firms on formal,

numerical justification of investments, bodes ill for high-ambiguity projects whose risk parameters – by definition – are hard to estimate objectively.

Learning

A strong emphasis on the *performing* organization – as is typical in most companies – often occurs at the expense of the *learning* organization (Senge 1990). Those characteristics that enabled the firm to find a profitable niche in the first place – such as creativity, flexibility, informality and a tolerance of failure – must largely be suppressed to deliver reliable results and reduce performance variance. If so, the firm's short-term performance may be optimized at the expense of its long-term survival prospects, due to lack of requisite variety (Ashby 1956). Balancing exploitation and exploration (March 1988) is a major challenge in most companies.

Various obstacles plague learning from experience. They range from rationalization and ego defences to incomplete or confounded feedback (see Russo and Schoemaker 2002). Since organizations may make only a small number of truly strategic decisions within any given management generation, they encounter the problem of infrequent feedback and, probably, a lack of independence in the outcomes. This suggests that outcome feedback will be noisy and limited, and that the emphasis should shift to process feedback. This requires examining *how* the decision was arrived at in terms of premises, data sets, choice procedures, incentive alignments, implementation and so on. Gulliver (1987) provides a practical example of the kind of 'decision auditing' from which firms can benefit.

Although post-mortems are a great way to learn from mistakes, the ultimate aim is to convert lessons learned the hard way into pre-mortems (Kahneman and Klein 2009). *Ex ante* learning requires a culture that permits mistakes and diversity. For example, learning about new technologies may require a new organizational unit separate from the mainstream business or technology. IBM adopted this path, for instance, when developing its PC, as did General Motors

(GM) for its Saturn project. Such separation is one way to resolve the inherent conflict between the performance and learning cultures in organizations (Senge 1990). To optimize performance over the next few periods, the firm should exploit what it knows best. To maximize its long-term survival, the firm must extend its capabilities through exploration. Long-term success may require short-term sacrifices. Managing this trade-off well requires an ambidextrous organization (O'Reilly and Tushman 2004), including a strong willingness to challenge the very mental models that made the firm successful.

See Also

- ▶ [Behavioural Strategy](#)
- ▶ [Information and Knowledge](#)
- ▶ [Learning and Adaptation](#)
- ▶ [Organizational Learning](#)
- ▶ [Overconfidence](#)
- ▶ [Resource Allocation Theory](#)

References

- Allison, G.T. 1971. *Essence of decisions: Explaining the Cuban missile crisis*. Boston: Little, Brown.
- Ashby, W.R. 1956. *Introduction to cybernetics*. New York: Wiley.
- Bower, J.L. 1971. *Managing the resource allocation process*. Cambridge, MA: Harvard University Press.
- Cohen, M.D., J.G. March, and J.P. Olsen. 1972. A garbage can model of organizational choice. *Administrative Science Quarterly* 17: 1–25.
- Einhorn, H., and R. Hogarth. 1986. Decision making under ambiguity. *Journal of Business* 59: S225–S250.
- Ellsberg, D. 1961. Risk, ambiguity and the savage axioms. *Quarterly Journal of Economics* 75: 643–669.
- Gulliver, F. 1987. Post-project appraisals pay. *Harvard Business Review* 65: 128–132.
- Janis, I. 1982. *Groupthink*. Boston: Houghton Mifflin.
- Kahneman, D., and G. Klein. 2009. Conditions for intuitive expertise: A failure to disagree. *American Psychologist* 64: 515–526.
- Kahneman, D., and A. Tversky. 1979. Prospect theory. *Econometrica* 47: 263–292.
- Kahneman, D., P. Slovic, and A. Tversky (eds.). 1982. *Judgment under uncertainty: Heuristics and biases*. New York: Cambridge University Press.
- Kaplan, R.S. 1986. Must CIM be justified by faith alone? *Harvard Business Review* 64: 87–95.

- Kets de Vries, M.F.R., and D. Miller. 1987. *Unstable at the top*. New York: NAL Books.
- Klayman, J., J.B. Soll, C. Gonzalez-Vallejo, and S. Barlas. 1999. Overconfidence: It depends on how, what, and whom you ask. *Organizational Behavior and Human Decision Processes* 79: 216–247.
- March, J.G. 1988. *Decisions and organizations*. Oxford: Basil Blackwell.
- Mason, R.O., and I.I. Mitroff. 1981. *Challenging strategic planning assumptions*. Chichester: Wiley-Interscience.
- O'Reilly, C.A., and M. Tushman. 2004. The ambidextrous organization. *Harvard Business Review* 82: 74–83.
- Russo, J.E., and P.J.H. Schoemaker. 1992. Managing overconfidence. *Sloan Management Review* 33: 7–17.
- Russo, J.E., and P.J.H. Schoemaker. 2002. *Winning decisions: Getting it right the first time*. New York: Doubleday.
- Schoemaker, P.J.H. 1990. Strategy, complexity and economic rent. *Management Science* 36: 1178–1192.
- Schoemaker, P.J.H. 1993. Strategic decisions in organizations. *Journal of Management Studies* 30: 107–129.
- Schultze, T., F. Pfeiffer, and S. Schulz-Hardt. 2012. Biased information processing in the escalation paradigm. *Journal of Applied Psychology* 97: 16–32.
- Senge, P.M. 1990. The leader's new work: Building learning organizations. *Sloan Management Review* 19: 7–23.
- Thaler, R.H. 1980. Towards a positive theory of consumer choice. *Journal of Economic Behavior & Organization* 1: 39–60.
- Tversky, A., and D. Kahneman. 1974. Judgment under uncertainty: Heuristics and biases. *Science* 185: 1124–1131.
- Tversky, A., and D. Kahneman. 1986. Rational choice and the framing of decisions. *Journal of Business* 59: S251–S284.
- Weber, E.U., and E.J. Johnson. 2009. Mindful judgment and decision making. *Annual Review of Psychology* 60: 53–85.

Demand for Innovation

Richard Priem¹ and Sali Li²

¹Texas Christian University, Neeley School of Business, Fort Worth, TX, USA

²University of South Carolina, Darla Moore School of Business, Columbia, SC, USA

Abstract

Innovation research from the demand side is bringing a new focus to the ► [innovation](#) literature; rather than examining only internal ► [technology strategy](#) factors to study innovation, demand for innovation research incorporates customers' demand as another factor

driving firm innovation. We review recent developments from research on demand-side approaches to technology innovation. We organize our comments along two key questions: (1) How does consumer demand contribute to firms' value creation? and (2) What are the implications of heterogeneous consumer demand for firms' innovation strategies? We hope this new theoretical approach will combine with technology-driven work to improve our understanding of innovation processes.

Definition 'Demand for innovation' (also known as demand-side innovation and demand-pull innovation) refers to innovation driven by advanced users or consumer demand, even when that demand may be latent.

Technology innovation scholars have long debated whether ► [innovation](#) is driven by technological break-throughs or by market demand (e.g., Freeman 1974; von Hippel 1976). Yet research has focused primarily on how firms' internal ► [technology strategy](#) resources drive innovation trajectories (see Benner and Tripsas 2012). Christensen's (1997) seminal work, suggesting that incumbent firms attending too much to customers may simply not see disruptive technologies, supported a research emphasis on technology-driven innovation.

Empirical anomalies are pointing researchers towards demand-side explanations for some innovations, however. Research has shown, for example, how an incumbent's inability to identify future demand can cause failure in the face of disruptive technology change, challenging the universality of Christensen's innovator's dilemma (e.g., Danneels 2008). Moreover, advanced users are becoming increasingly involved in innovation design processes due to new business models such as open sourcing (von Krogh and von Hippel 2006; Baldwin and von Hippel 2010) and the increasing availability of venture capital for innovative consumers (Shah and Tripsas 2007). Benner and Tripsas (2012) recently demonstrated that consumer-preferred product features were critical to the emergence of a dominant design for digital cameras – a finding that contrasts

markedly with the prior emphasis on technology-based explanations for new dominant designs.

These demand-side phenomena are not new: the intermittent windscreen wiper was developed by car driver Robert Kearns in 1963, and hip-hop DJs more recently modified turntable features so they could better ‘scratch’ the beat (Faulkner and Runde 2009). Such consumer-driven innovations warrant investigation due to their potentially unique implications for innovation research, policymaking and practice (Baldwin and von Hippel 2010).

We review recent developments from research on demand-side approaches to technology innovation. We organize our comments along two key questions: (1) How does consumer demand contribute to firms’ value creation? and (2) What are the implications of heterogeneous consumer demand for firms’ innovation strategies?

Consumer Demand and Innovative Value Creation

Seeing value creation from the consumer side (e.g., von Hippel 1976; Prahalad and Ramaswamy 2004) gives new emphasis to the roles of consumer users in the innovation process. Recent studies have found that consumer users are major drivers of innovation, especially in consumer goods sectors, and that firms intentionally get consumers involved in their innovation processes (for a review see Bogers et al. 2010). Gruber et al. (2008, 2012) discovered that, given the variety of market segments, technology entrepreneurs must identify suitable market opportunities before they can successfully commercialize their innovations. Moreover, some scholars have started to focus on the implications of consumer innovation for technology transfer and value appropriation. Smith and Shah (2010), for example, examined the mechanisms that facilitate knowledge transfer between the user innovator and established firms in a variety of industries. And by studying 169 Danish firms attempting to utilize consumer innovations, Foss et al. (2011) discovered that firms need to have certain internal organization practices – such as intensive vertical and lateral communication,

employee rewards for sharing and acquiring knowledge, and high levels of delegation of decision rights – in order to effectively leverage valuable consumer knowledge. These studies shed new light on the drivers of innovative products and are a step towards a more comprehensive understanding of firm innovation.

Demand Heterogeneity and Innovation

Market heterogeneity also influences innovation and technology evolution. A series of studies (e.g., Danneels 2008; Adner and Snow 2010) demonstrate that demand landscapes can shape the opportunity structures for firms’ innovations. By acknowledging that market demands can be heterogeneous, this research stream shows that an effective consumer-oriented innovation strategy must address the issues of what consumer group on which to focus, and to what extent a firm needs to engage that particular consumer group. Danneels (2008), for example, showed that different levels of engagement with customers affect a firm’s innovative capability. Reuber (2008) closely examined survivors of disruptive innovation in the computer graphics chip industry in the mid-1990s. She found that even the surviving firms needed to respond to demand uncertainties to achieve long-term advantage. And Adner and Snow (2010) showed that incumbents facing a disruptive new technology can be better off avoiding investment in the new technology if a large enough consumer group is satisfied with the features of the older technology.

Recent studies have also shown that the dynamics of consumer demand have implications for firm innovation. Adner and Levinthal (2001) used computer simulation to show that market heterogeneity can result in a new stage in the technology lifecycle characterized by increasing performance at a stable price, which could not be identified with traditional supply-side approaches. Adner (2004) further proposed that consumer demand is not stable over time, but evolves in an S-curve that complements the traditional technology S-curve and provides novel implications for the technology lifecycle. Along this same line,

Tripsas (2008) recognized that the evolution of customer preferences – their preference trajectory – is based on cycles of incremental and discontinuous change in preferences. She found that each major technological transition in the type-setting industry was triggered by customer preference discontinuities instead of technology-driven factors. These studies have provided support for the importance of demand-side market heterogeneity and dynamics by demonstrating their connection with technology innovation.

Conclusion

Research on demand for innovation complements the dominant, technology-driven lens by providing a more comprehensive understanding of firm innovation. New issues have been raised, however, as this new conceptual frontier has been developed. Given the stream of research focusing on user innovation (cf., Bogers et al. 2010), the extent to which the demand-side approach will uniquely benefit user innovation research will remain unclear until a more detailed conceptual framework can be developed.

Fittingly, scholars have started to pursue a more detailed specification of the demand-side ‘pull’ approach to innovation. For instance, Di Stefano et al. (2009) argue that a demand-pull innovation is one that produces a shift of the demand curve, implying an increase in consumers’ willingness to pay and, thus, greater value creation. But issues remain, such as how this definition can be operationalized. One potentially feasible approach for distinguishing demand-side and technology-driven innovations is to combine archival data, such as patent data, with primary data and qualitative data, such as interviews with inventors, to gauge the extent to which an innovation is spurred by and oriented towards customers. Then, researchers can cluster the patent-level information to the firm level, to depict firms’ tendencies towards more technology-driven or more demand-pull innovation approaches in their technology management.

In sum, innovation research from the demand side is bringing a new focus to the innovation

literature; rather than examining only internal technology factors to study innovation, demand for innovation research incorporates customers’ demand as another factor driving firm innovation. We hope this new theoretical approach will combine with technology-driven work to improve our understanding of innovation processes.

See Also

- ▶ Collaborative Innovation
- ▶ Innovation
- ▶ Markets for Technology
- ▶ Open Innovation
- ▶ Technology Strategy

References

- Adner, R. 2004. A demand-based perspective on technology life cycles. In *Business strategy over the industry lifecycle: Advances in strategic management*, vol. 21, ed. J. Baum and A. McGahan. Cambridge, MA: Harvard University Press.
- Adner, R., and D. Levinthal. 2001. Demand heterogeneity and technology evolution: Implications for product and process innovation. *Management Science* 47: 611–628.
- Adner, R., and D. Snow. 2010. Old technology responses to new technology threats: Demand heterogeneity and technology retreats. *Industrial and Corporate Change* 19: 1655–1675.
- Baldwin, C., and von E. Hippel. 2010. *Modeling a paradigm shift: From producer innovation to user and open collaborative innovation*. Working paper No. 4764–09. Cambridge, MA: MIT Sloan School of Management.
- Benner, M., and M. Tripsas. 2012. The influence of prior industry affiliation on framing in nascent industries: The evolution of digital cameras. *Strategic Management Journal* 33: 277–302.
- Bogers, M., A. Afuah, and B. Bastian. 2010. Users as innovators: A review, critique, and future research directions. *Journal of Management* 36: 857–875.
- Christensen, C. 1997. *The innovator’s dilemma: When new technologies cause great firms to fail*. Boston: Harvard Business School Press.
- Danneels, E. 2008. Organizational antecedents of second-order competences. *Strategic Management Journal* 28: 519–543.
- Di Stefano, G., A. Gambardella, and G. Verona. 2009. *A demand-based view of technological innovation: A review, conceptualization, and future research directions*. Working paper, Bocconi University, Milan.
- Faulkner, P., and J. Runde. 2009. On the identity of technological objects and user innovations in function. *Academy of Management Review* 34: 442–462.

- Foss, N.J., K. Laursen, and T. Pedersen. 2011. Linking customer interaction and innovation: The mediating role of new organizational practices. *Organization Science* 22: 980–999.
- Freeman, C. 1974. *The Economics of industrial innovation*. Harmondsworth: Penguin.
- Gruber, M., I. MacMillan, and J. Thompson. 2008. Look before you leap: Market opportunity identification in emerging technology firms. *Management Science* 54: 1652–1665.
- Gruber, M., I. MacMillan, and J. Thompson. 2012. From minds to markets: How human capital endowments shape market opportunity identification of technology start-ups. *Journal of Management* 38: 1421–1449.
- Prahalad, C., and V. Ramaswamy. 2004. *The future of competition: Co-creating unique value with customers*. Boston: Harvard Business School Press.
- Reuber, R. A. 2008. Heterogeneity among survivors of a competence-destroying technological discontinuity. Best paper proceedings of the annual meeting of the academy of management.
- Shah, S.K., and M. Tripsas. 2007. The accidental entrepreneur: The emergent and collective process of user entrepreneurship. *Strategic Entrepreneurship Journal* 1: 123–140.
- Smith, S., and S. Shah. 2010. Knowledge transfer between user and established firms: CVC investment and physician-entrepreneurs in the medical device industry. Working paper, Temple University, Philadelphia.
- Tripsas, M. 2008. Customer preference discontinuities: A trigger for radical technological change. *Managerial and Decision Economics* 29: 79–97.
- Von Hippel, E. 1976. The dominant role of users in the scientific instrument innovation process. *Research Policy* 5: 212–239.
- Von Krogh, G., and E. von Hippel. 2006. The promise of research on open source software. *Management Science* 52: 975–983.

Depreciation

Joseph K. Tanimura
Berkeley Research Group, LLC,
Los Angeles, CA, USA

Definition Depreciation is a method by which capitalized costs of long-lived tangible assets (other than land, which is not depreciated) are allocated to subsequent periods.

The physical deterioration of assets over time is an economic fact of life that must be included in investment evaluation. Depreciation

expense is the means by which capital expenditures on assets are allocated to future time periods. In order to determine the amount of depreciation to take on a certain asset, three estimates are required: the useful life of the equipment (or its total lifetime productive capacity), its expected residual value at the end of that useful life and the method of allocation to be employed.

Generally speaking, two methods are used for allocating an asset's cost over its useful life. Under the straight-line method, the asset is depreciated by a uniform amount in each year. Consider as an example a network switch that costs \$100,000, with a useful life of 3 years and a residual value of \$10,000. Under the straight-line method, the network switch will be depreciated by \$30,000 $((\$100,000 - \$10,000)/3)$ per year.

The second method of cost allocation is a group of techniques known as accelerated depreciation. The techniques charge more depreciation in the early years of an asset's life and correspondingly less in later years. Continuing the previous example, accelerated depreciation might call for \$40,000, \$30,000 and \$20,000 in years 1, 3 and 3 respectively.

Depreciation expense is a non-cash charge, and hence irrelevant when calculating pre-tax cash flows. After-tax cash flow, however, does rise with depreciation; that is, depreciation is a non-debt tax shield. Therefore, while accelerated depreciation doesn't enable a firm to take more depreciation in total, it alters the timing of the recognition, leading to higher after-tax income in earlier periods and lower after-tax income in later periods, *ceteris paribus*. Continuing the previous example, assume a corporate tax rate of 30%. Straight-line depreciation reduces taxes by \$9,000 $(\$30,000 \times 30\%)$ in year 1. Accelerated depreciation reduces taxes by \$12,000 $(\$40,000 \times 30\%)$ in year 1, or \$3,000 more than straight-line depreciation. The relationship is reversed in year 3, with straight-line depreciation reducing taxes by \$3,000 more than accelerated depreciation. However, owing to the time value of money, the present value of the after-tax cash flows is higher under accelerated depreciation.

The calculation of depreciation is, to a large extent, at the discretion of management. Accrual accounting rules currently permit a variety of methods for determining the amount of depreciation expense to be recorded. Moreover, the amount is a function of assets' estimated useful lives, and requires arbitrary assumptions about the rates of wearing out, rate of development of new technologies, obsolescence and other projections. A longer useful life and higher expected residual value, for example, decrease the amount of annual depreciation relative to a shorter useful life and lower expected residual value. In general, if a company is aggressive and depreciates its assets rapidly, it will tend to understate current earnings, and vice versa.

Another important feature of depreciation accounting involves taxes. To the extent that tax rules allow a company to keep two sets of books – one for managing the company and reporting to shareholders, and another for calculating the firm's tax bill – the choice of depreciation method can complicate the analysis of a company's financial statements.

Academic research on firms' depreciation method choices has possibly suffered from a perception that 'depreciation is one accounting issue where the effects of the different methods are obvious and well understood' (Ricks 1982: 71). Research has primarily focused on the market- and contracting-related consequences of firms' depreciation method choices. For example, Kaplan and Roll (1972) find that changes from accelerated depreciation to straight-line depreciation have no discernible stock price effects even if earnings are greater under the new method. Furthermore, even in the absence of market-related consequences, a firm's choice of depreciation method may have economic consequences if it affects its reported earnings and therefore how cash flows are divided among contracting parties (Fields et al. 2001). Recent research, however, provides evidence that firms' depreciation method choices have economic consequences even in the absence of market- and contracting-related consequences. Jackson (2008) concludes that lower earnings combined with psychological forces may push managers of firms that use straight-

line depreciation away from making economically efficient capital investment decisions. Jackson et al. (2009) find that firms that use accelerated depreciation make significantly larger capital investments than firms that use straight-line depreciation. The results in these articles show that a choice made for external financial reporting purposes can have economic consequences.

See Also

- ▶ [Business Strategy](#)
- ▶ [Capital Structure](#)

References

- Fields, T., T. Lys, and L. Vincent. 2001. Empirical research on accounting choice. *Journal of Accounting and Economics* 31: 255–307.
- Jackson, S.B. 2008. The effect of firms' depreciation method choice on managers' capital investment decisions. *Accounting Review* 83: 671–693.
- Jackson, S.B., X. Liu, and M. Cecchini. 2009. Economic consequences of firms' depreciation method choice: Evidence from capital investments. *Journal of Accounting and Economics* 48: 54–68.
- Kaplan, R., and R. Roll. 1972. Investor evaluation of accounting information: Some empirical evidence. *Journal of Business* 45: 225–257.
- Ricks, W. 1982. Market assessment of alternative accounting methods: A review of the empirical evidence. *Journal of Accounting Literature* 1: 59–102.

Design Thinking

Massimo Garbuio¹ and Dan Lovallo²

¹The University of Sydney, Business School, Sydney, NSW, Australia

²The University of Sydney, Faculty of Economics and Business, Sydney, NSW, Australia

Definition Design thinking encompasses the cognitions, processes and tools that aim to describe how designers think and work in the creation of desired futures.

Design Thinking

Design thinking encompasses the cognitions, processes and tools that aim to describe how designers, and any individual with a design attitude, think and work in the creation of desired futures. The definition and what comprises design thinking is in constant flux and expansion and no single definition represents the wealth of discussion that has taken place over the years since the term became part of the collective consciousness of design researchers (Rowe 1987).

Strategy Problems as Design Problems

Simon (1969) recognized the centrality of design in applied disciplines such as engineering, medicine, business and architecture since they are concerned not with how things are but with how they might be. Indeed, of key significance is the elaboration of design as the approach for addressing ‘ill-structured’ and ‘wicked problems’ (Simon 1969; Rittel and Webber 1973), where the problem itself is subject to multiple interpretations and potential solutions are many, with none of them able to be proven to be correct. Strategy problems as problems requiring a design approach have been elaborated in, for example, Liedtka and Mintzberg (2006) and Martin (2009). Rumelt (2011) uses the design metaphor to clarify that effective strategies are designs rather than decisions – that is, they are constructed rather than chosen – and, therefore, master strategists are designers more than decision makers.

The Tenets of Design Thinking: Cognitions, Processes and Tools

Despite the fact that the definition and what comprises design thinking are in constant flux and expansion, there have been several key tenets of design thinking that have become widespread and are now to a large extent accepted. These include (1) abduction, as the process of forming an

explanatory hypothesis of ‘what might be’ and is the only logical operation which introduces any new ideas, as opposed to deductive and inductive reasoning (Charles Peirce, cited in Hoffmann 1997); (2) framing, to describe a problematic situation in alternative ways; (3) user centricity, as the empathic understanding of users based on fieldwork research; (4) designing as a process of knowledge development that includes both analytic and synthetic elements that operate both in theoretical and practical realms; (5) prototyping as the means by which designers communicate the rationales of their design decisions and perform hands-on experimentation, visualization and evolutionary learning, made as simple as possible to stimulate reflections and obtain useable feedback. Design thinking has also been explored as a humanistic art addressing the design of systems, so as a process of argumentation rather than merely analysis and synthesis (Buchanan 1992). Other processes and tools of designers particularly relevant to strategy formulation are reflective practice (Schön 1983) and the use of metaphors and analogies in strategic conversations. Extensive discussions of design thinking tools for strategy formulation are elaborated in both Liedtka and Olgivie (2011) and Fraser (2012).

See Also

- ▶ [Cognition and Strategy](#)
- ▶ [Collaborative Innovation](#)
- ▶ [Innovation](#)
- ▶ [Innovation Strategies](#)
- ▶ [Rumelt, Richard \(Born 1942\)](#)
- ▶ [Simon, Herbert A. \(1916–2001\)](#)
- ▶ [Strategic Decision-Making](#)
- ▶ [Strategic Learning](#)

References

- Buchanan, R. 1992. Wicked problems in design thinking. *Design Issues* 8: 5–21.
- Fraser, H.M. 2012. *Design works: How to tackle your toughest innovation challenges through business design*. Toronto: University of Toronto Press.

- Hoffmann, M. 1997. Is there a 'logic' of abduction. Proceedings of the 6th Congress of the IASS-AIS, Guadalajara, Mexico, 13–18 July.
- Liedtka, J., and H. Mintzberg. 2006. Time for design. *Design Management Review* 17: 10–18.
- Liedtka, J., and T. Ogilvie. 2011. *Designing for growth*. New York: Columbia University Press.
- Martin, R.L. 2009. *The design of business: Why design thinking is the next competitive advantage*. Boston: Harvard Business Press.
- Owen, C.L. 1998. Design research: Building the knowledge base. *Design Studies* 19: 9–20.
- Rittel, H.W., and M.M. Webber. 1973. Dilemmas in a general theory of planning. *Policy Sciences* 4: 155–169.
- Rowe, P.G. 1987. *Design thinking*. Cambridge, MA: The MIT Press.
- Rumelt, R. 2011. *Good strategy bad strategy: The difference and why it matters*. New York: Crown Business.
- Schön, D.A. 1983. *The reflective practitioner: How professionals think in action*. New York: Basic Books.
- Simon, H.A. 1969. *The sciences of the artificial*. Cambridge, MA: The MIT Press.

Diseconomies of Scale

Stephen L. Cheung
University of Sydney, School of Economics,
Sydney, Australia

Definition Diseconomies of scale occur when a firm's unit costs increase with its size, implying a limit to its efficient scale of operation. Managerial limitations are thought to be a primary source of such diseconomies.

In textbook economic theory, diseconomies of scale arise when a firm's long-term unit costs increase with its scale of operation. As a cost concept, this allows for the efficient combination of resources to be reoptimized in response to increasing scale. As a long-term concept, the firm is presumed to have the flexibility needed to vary all its resources requirements. Diseconomies of scale are thus conceptually distinct from increasing unit costs in the short run, which result from diminishing marginal returns when some resources are fixed.

The possibility of diseconomies is germane to strategy because, if present, they imply a limit to the efficient size of firms, with consequent implications for the structure of markets. Yet whereas diminishing returns from a fixed resource are perhaps inevitable, it is less obvious why this should be the case for long-run diseconomies. To see why, suppose that a firm, having attained its minimum efficient scale, now seeks to double its output. Then it appears that it could *at worst* achieve constant returns to scale by simply replicating its original combination of inputs. This prompts Coase's (1937: 394) rhetorical question: 'Why is not all production carried out by one big firm?'

A leading explanation for why this does not occur identifies managerial limitations as the primary cause, since beyond a certain point the costs of coordination and control increase more than proportionately with the size of the firm. This proposition dates back to Robinson (1934) and is commonly referred to as 'managerial diseconomies of scale', although it might be more accurately characterized as diminishing returns from a firm's productive resources with respect to the limited capacities of its management (Kaldor 1934: 67).

Williamson (1967) provides a seminal early model of the sources of managerial diseconomies, which he identifies as being twofold. First, since each manager has a limited 'span of control', there is a limit on the number of subordinates whose activities she can effectively direct. It follows that as a firm expands it becomes necessary to add more layers of hierarchy. Second, with increased hierarchy, the transmission of information to, and directives from, top management must pass through more intermediaries, becoming increasingly distorted in the process.

Rasmusen and Zenger (1990) and McAfee and McMillan (1995) offer contemporary accounts of the sources of managerial diseconomies, using the apparatus of modern contract theory. Their two frameworks do not overlap precisely; however, there is a useful complementarity between them. On one hand, Rasmusen and Zenger focus on the *horizontal* diseconomies associated with adding

an extra agent under the supervision of a single principal. In their account, this makes it more costly for the principal to accurately detect when shirking has occurred. On the other hand, McAfee and McMillan revisit the *vertical* diseconomies resulting from adding an extra layer of hierarchy between the agent and top management. In their model, the agent enjoys bargaining power from the fact that he has more accurate information regarding the true state of demand or cost. To induce the agent to act appropriately on this private information, it is necessary to reward him with some rent. This problem is reproduced at each level of the hierarchy, resulting in managerial diseconomies.

It should be remembered that in a complete analysis of optimal firm size managerial diseconomies must be considered in conjunction with technological economies. As McAfee and McMillan note, in the case of horizontal merger, two further considerations enter the calculation. These are the internalization of externalities that firms inflict on one another when they compete in the product market and cost efficiencies achieved through reallocating activities between production units.

See Also

- ▶ [Economies of Scale](#)
- ▶ [Firm Size and Boundaries, Strategy](#)
- ▶ [Market Structure](#)
- ▶ [Multi-plant Economies](#)

References

- Coase, R.H. 1937. The nature of the firm. *Economica* 4: 386–405.
- Kaldor, N. 1934. The equilibrium of the firm. *Economic Journal* 44: 60–76.
- McAfee, R.P., and J. McMillan. 1995. Organizational diseconomies of scale. *Journal of Economics & Management Strategy* 4: 399–426.
- Rasmusen, E., and T. Zenger. 1990. Diseconomies of scale in employment contracts. *Journal of Law, Economics, and Organization* 6: 65–92.
- Robinson, A. 1934. The problem of management and the size of firms. *Economic Journal* 44: 242–257.
- Williamson, O.E. 1967. Hierarchical control and optimal firm size. *Journal of Political Economy* 75: 123–138.

Diseconomies of Time Compression

Karel Cool¹, Ingemar Dierickx² and Luis Almeida Costa³

¹INSEAD, Fontainebleau, France

²ID Consulting Ltd, Burnside, Christchurch, New Zealand

³Universidade Nova de Lisboa, Lisbon, Portugal

Abstract

This entry discusses the concept of time compression diseconomies and its importance to the sustainability of competitive advantage. It focuses on a key driver of time compression costs, the time dependency of resource accumulation, and illustrates the effects of three characteristics of this accumulation process (productivity, cycle time and absorption constraints). The effects are illustrated using a stylized stocks-flows simulation with iThink software.

Definition Time compression diseconomies are the additional costs incurred by firms seeking to quickly reach a given level of an asset stock when this stock could be accumulated more economically over a longer period of time. This will be the case when maintaining a given rate of investment for a given interval produces a larger increase in the resource level than maintaining twice the investment rate over half the interval.

Resources as Asset Stocks

Most resources are the cumulative result of a series of investments over a period of time (Dierickx and Cool 1989). For example, a firm's reputation for quality is the result of a consistent set of policies on production and quality control, and a consistent investment in communication with customers. Similarly, a business school's key resource, its reputation for excellence in teaching and research, reflects its past investments in faculty, the faculty's investment in research and teaching, and 'word of mouth' advertising of its

alumni base. Likewise, the cost per unit of making a product is related to the cumulative experience in making this product (i.e., the experience curve). More generally, we can state that resources are *stocks*, which are accumulated over time by a stream of investments or *flows*.

It may be useful to provide an intuitive anchor for the view of resources as asset stocks. A resource may be pictured as the amount of water in a ‘bathtub’. This is the cumulative result of flows of water into the tub through the tap and out of it through a hole. Similarly, the ‘level’ of an asset stock is the cumulative result of investment flows, which build the asset, and outflows that erode the asset over time. In the example of research and development (R&D), the amount of water in the tub represents the stock of know-how at a particular moment in time. The fact that know-how depreciates or that private knowledge becomes common knowledge is represented by the flow of water leaking through the hole into the tub.

The fact that stocks do not adjust as quickly as flows lies at the heart of the sustainability of ► **competitive advantage** (Barney 1986; Dierickx and Cool 1989; Conner 1991; Amit and Schoemaker 1993; Peteraf 1993; Makadok 2001; Cool et al. 2002; Foss and Knudsen 2003). If competitors have different asset stock levels, the stock-flow dynamics imply that it will take time for them to catch up with the firm that has a higher asset stock level. The time it will take to catch up and the cost of this effort depends on the difference in the asset stock levels and the difference in the net investments (inflows) among competitors. Moreover, not all stocks are built in exactly the same way. Several characteristics of stock accumulation processes influence the time and cost of imitation. Some relate to economies of resource accumulation where ‘(initial) success breeds (further) success’, helping first movers to sustain their lead. A second set of processes relate to *diseconomies of time compression*, that is, the time–cost trade-offs in the accumulation and imitation of resources. This is the focus of the present entry.

This entry first describes the concept and its importance to the sustainability of competitive

advantage. It then focuses on a key driver of time compression costs – the time dependency of resource accumulation – and thereafter explores the effect of three characteristics of this accumulation process (productivity, cycle time and absorption constraints). The effects are illustrated using a stylized stocks-flows simulation with the iThink software.

Time Compression Costs

In the absence of accumulation economies, latecomers may be able to build resources at the same cost as the firms that were among the first to build high resource levels. Yet, since stocks do not adjust as fast as flows, catch-up efforts typically take time (Dierickx and Cool 1989; Pacheco-de-Almeida and Zemsky 2003, 2007). Latecomers who wish to shorten the time needed to build the resources may have to accept *diseconomies of time compression* (even if there are no economies of resource accumulation). This will be the case when maintaining a given rate of investments produces a larger increase in the resource level than maintaining twice the investment rate over half the interval. For example, crash R&D programmes are typically less effective than R&D programmes where annual outlays are lower but spread out over a proportionally longer period of time. Similarly, MBA students may not accumulate the same stock of knowledge in a 1-year course as in a 2-year course, even if all inputs, except time, are doubled. Further, firms do not achieve the same learning from consultants if these double their efforts in half the period compared with an effort of lower but sustained intensity. And, of course, time compression diseconomies affect learning: Freek Vermeulen (2009), in a telling example, points out that as a child he found out that practising the cello on 1 day for 3 h doesn’t produce the same result as practising half an hour each day for 6 days!

The importance of diseconomies of time compression is intuitively clear: if diseconomies are large, they provide extra protection to the firms that were the first to build resources; their resources stay unique for a longer time.

The same applies the other way around: with low diseconomies, latecomers can catch up quickly to first movers and incur few cost penalties (if there are no economies of resource accumulation).

What are the sources of these diseconomies? When do they occur? Can the diseconomies of time compression be reduced? Below, we discuss one major driver of diseconomies of time compression: *the time dependency* of resource accumulation.

Time Dependency of Resource Accumulation

The time dependency of resource accumulation refers to the *sequencing of tasks* that needs to occur in order to obtain an end result. In new product development, for example, there typically is an initial period during which research needs to be conducted before new ideas and projects may be formulated. This is followed by a product development period where ideas are further developed and tested and where the decision is made to launch or terminate the effort. Close coordination among research, product development and marketing may reduce the time required to move a product through the development cycle (Urban and Hauser 1990: 69–75). However, some time lags are inevitable since products may need to be tested in the lab before they are tested in the market. Sometimes, the sequencing is regulated, as in the case of products where consumer safety is at stake (e.g., foods, drugs, chemicals, engines, planes, cars). What is the consequence of this time dependency of resource accumulation for efforts to catch up to first movers?

A simple numerical example helps to illustrate some of the key effects. Let us consider the competition between an early mover, firm A, and a latecomer, firm B (see Fig. 1). A enters a market 5 years before B and spends \$100m a year on research to generate new products. Firm B waits 5 years but then commits \$200m a year to catch up with firm A.

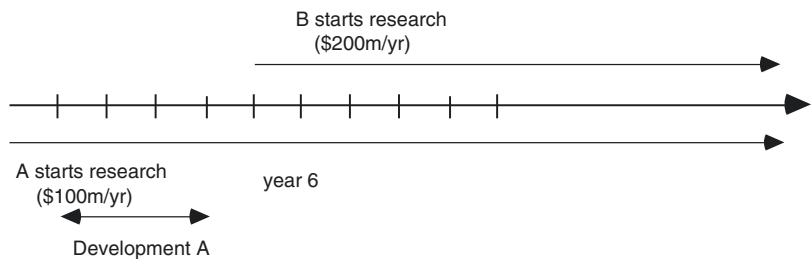
For simplicity, let us assume that the new product output from the research is proportional to *current* research spending (this is similar to assuming that proprietary research know-how becomes public knowledge after 1 year) and that this relation is the same for both firms. That is, both have the same R&D productivity rate, say 0.20, which multiplied times the annual research spending gives the number of products that are generated. Further, A and B face the same time dependency constraint: after the research stage of 1 year, it takes another 3 years to move a project through feasibility studies, testing, obtaining regulatory approval and so forth, before a new product is actually launched. Given the time dependency as specified in our example, when can B hope to have caught up with A if both maintain their R&D spending levels?

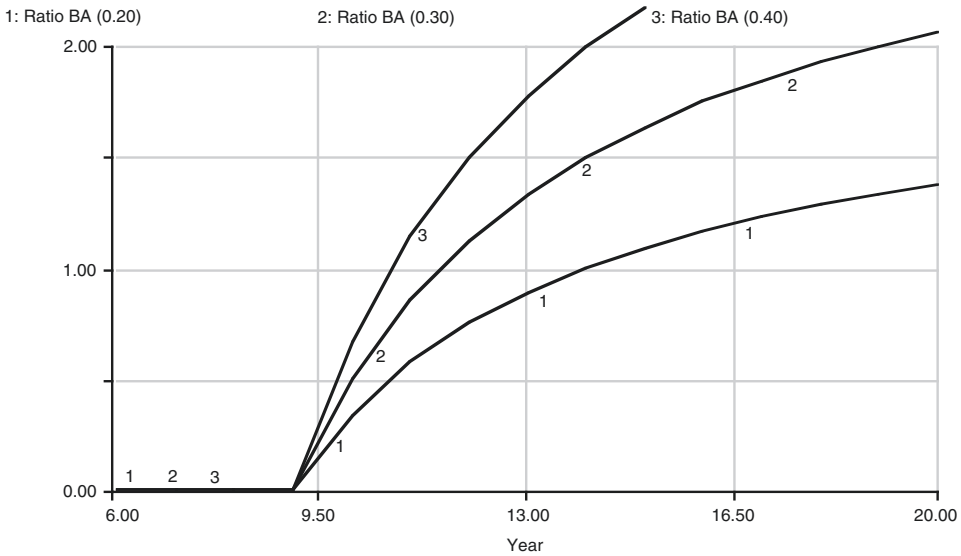
Figure 2 shows the simulated ratio of the stock (cumulative number) of products that are launched by B and A at the end of each year (from year 6 onwards). If the ratio is below 1, this indicates that firm B has not caught up to A since, cumulatively, A has launched more products. Similarly, when the curve shows a value of 1 or more, it indicates that B has caught up to A.

Line 1 shows what happens when both firms have the same research productivity, 0.20. It is not until year 14 that B matches the total number of product launches of A. By the end of the tenth

Diseconomies of Time Compression,

Fig. 1 R&D spending programme of firms A and B





Diseconomies of Time Compression, Fig. 2 Time to catch up to the first mover with different rates of productivity

year, when both firms have made the same cumulative investment (\$1b), B is still lagging significantly, launching only one-third as many new products as A. This is the case even though A only adds 20 projects to the R&D pipeline (100 times 0.20) a year while B feeds its pipeline at a rate of 40 per year (200 time 0.20). It takes 9 years (years 6–14) and an extra \$400 m for B to pull even with firm A. Clearly, when the accumulation of resources is subject to time dependency, latecomers pay a penalty to catch up.

Productivity

What would be the effect if B were able to achieve higher research productivity than A? Would this significantly reduce the time needed to pull even? In line 2 in Fig. 2, we assumed that B has a productivity that is 50% higher than A. The result can be read from the graph: B would be able to catch up to A by year 12 rather than year 14. Even with a research productivity that is *double* the rate of its rival, B still faces diseconomies – it does not pull even with A in the first 10 years.

Cycle Time

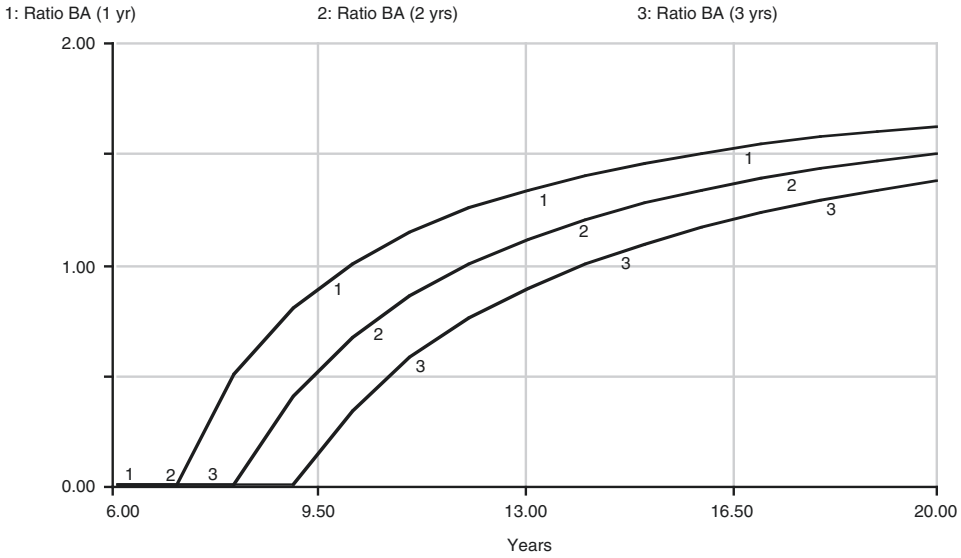
Rather than compressing the time needed to match the output of A by increasing research productivity, B may attempt to reduce cycle time, that is, the

time period spanning research, development and market launch. How does this impact overall time compression? Figure 3 maps the ratio of cumulative product launches of B and A. Line 3 shows the baseline case with a cycle time of 4 years (1 year of research and 3 years of testing). This is the same curve as line 1 in Fig. 2 above. When B reduces its cycle time to 2 years (line 1), we see that A and B achieve the same cumulative number of product launches by year 10, that is, after 5 years for B. This is because B moves twice the number of products (double R&D spending) at twice the speed (half the cycle time) through the pipeline. In all intermediate cases, B needs to wait beyond year 10 to match A’s cumulative output. Only if the reduction of cycle time comes at no extra cost to B would it eliminate the diseconomies of time compression (as shown in line 1). In the other cases, B still has to accept extra costs to compress time.

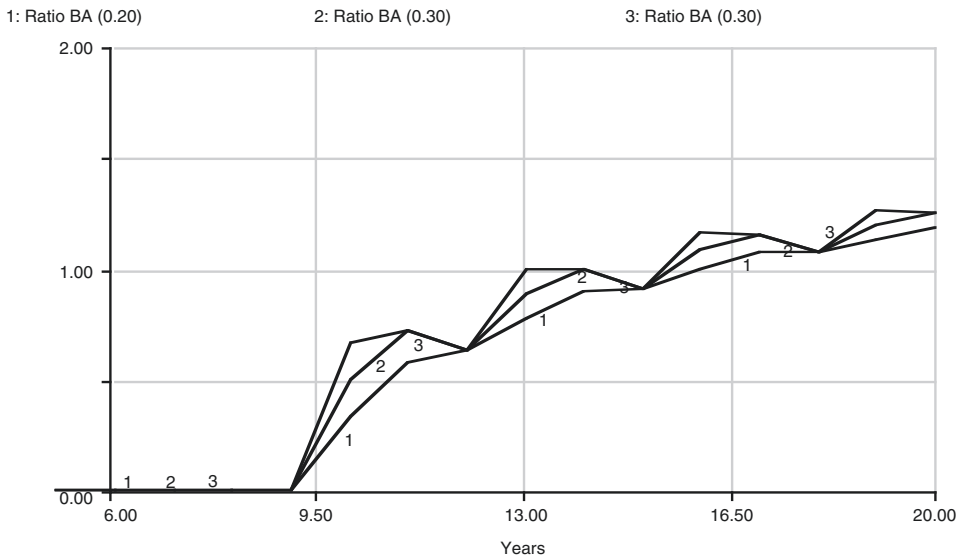
Absorption Constraints

The reduction of cycle time has the advantage that, at any given point, fewer products are in the pipeline. This stands in contrast to higher investment in research productivity, which increases the number of products that are under development and launched in a given period. If firms have





Diseconomies of Time Compression, Fig. 3 Time to catch up to the first mover and cycle time

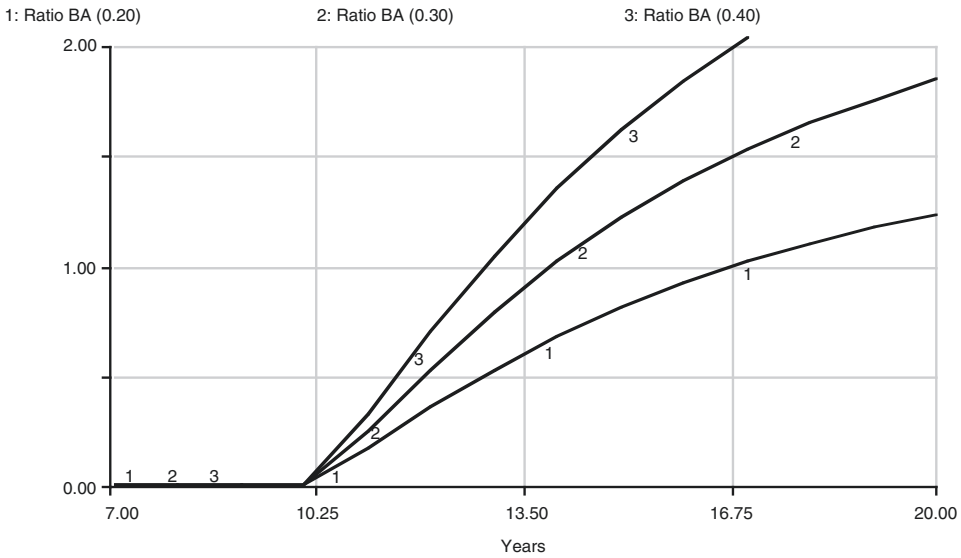


Diseconomies of Time Compression, Fig. 4 Time to catch up and limits to learning

unlimited processing capacity, then this does not matter. However, what is the effect when – more realistically – late entrants face constraints on the number of projects they can handle (Cohen and Levinthal 1990)? In Fig. 4, we have simulated the effects of such constraints. Both A and B face a limit on how many projects they can develop at any time: 100. As before, B spends twice as much and thus moves projects into the development

pipeline at twice the rate than A. In addition, we factor in the possibility that B may be able to improve its research productivity. How fast does B catch up to A?

Figure 4 shows that massive investments to increase research productivity do not make sense when there is a limit to the number of projects that can be handled. Even dramatic improvements in research productivity are of little help. Line



Diseconomies of Time Compression, Fig. 5 Time to catch up to the first mover with research productivity driven by the stock of R&D know-how

3 shows a ‘go-stop’ cycle: with a productivity of 0.40, B hits the learning limit every 2 years and needs to wait for products to be fully developed and launched to take on new projects. Comparing Figs. 2 and 4, we see that, on average, the time for B to match the cumulative output of A has increased by about 2 years. Though such a result is to be expected, many corporations appear to be overconfident in their learning capacity and assume they can handle a very large number of projects. Many ‘re-engineering’ efforts suffer from congestion: too many teams work on too many projects and do not produce an output in proportion to the efforts.

Stocks Rather Than Flows Drive Research Output

In Figs. 2, 3, and 4, we assumed that the development of new products was driven by annual R&D spending. The assumption that current R&D spending drives research output was made to illustrate the essence of time compression costs. However, stocks drive competitive advantage, not flows (Wernerfelt 1984; Dierickx and Cool 1989; Peteraf 1993; Barney and Clark 2007). If proprietary know-how becomes available to the competition within 1 year, research output is

indeed driven by current spending. However, when private knowledge leaks into the industry at a slower pace, R&D spending develops into a stock of private know-how. How does the accumulation of R&D spending into stocks of private know-how affect time compression costs?

Let us say that the decay rate of the R&D stock is 0.33, or that one-third of a firm’s private knowledge becomes public after 1 year. Figure 5 shows the ratio of the stock of product launches of B to A. This may be compared to Fig. 2. As in Fig. 2, B catches up to A at a faster pace if its research productivity increases from 0.20 to 0.40. However, since stocks adjust slower than flows, it takes longer for B to catch up in Fig. 5. On average, it takes an extra 2 years for B to match the cumulative output of A. Thus, when R&D output is driven by stocks rather than flows, time compression diseconomies loom even larger.

In sum, the accumulation of many resources is characterized by lags that are due to the fact that at least some tasks need to be sequenced. This need to carry out activities in a particular order gives rise to time compression diseconomies: doubling the efforts over a particular period of time does not yield the same level of resources as maintaining an effort of half the intensity over a period which



is twice as long. This was illustrated in the context of new product development. With a simple numerical example, we illustrated that an increase in research productivity, a reduction of cycle time and an increase in the capacity to absorb new projects will reduce the cost to compress time (if these efforts do not demand extra investments). Conversely, if lags cannot be shortened or if the cost of these catch-up efforts is very high, firms that were first to accumulate high resource levels are well protected. Time compression diseconomies support the sustainability of an early mover's competitive advantage.

See Also

- ▶ [Competitive Advantage](#)
- ▶ [Complementary Asset](#)
- ▶ [First-Mover Advantage](#)
- ▶ [Resource-Based Theories](#)

References

- Amit, R., and P.J.H. Schoemaker. 1993. Strategic assets and organizational rent. *Strategic Management Journal* 14: 33–45.
- Barney, J. 1986. Strategic factor markets: Expectations, luck and business strategy. *Management Science* 32: 1231–1241.
- Barney, J., and D.N. Clark. 2007. *Resource-based theory: Creating and sustaining competitive advantage*. Oxford: Oxford University Press.
- Cohen, W., and D. Levinthal. 1990. Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly* 35: 128–152.
- Conner, K.R. 1991. A historical comparison of resource-based theory and five schools of thought within industrial organization economics: Do we have a new theory of the firm? *Journal of Management* 17: 121–154.
- Cool, K., L. Almeida Costa, and I. Dierickx. 2002. Constructing competitive advantage. In *Handbook of strategy and management*, ed. A. Pettigrew, H. Thomas, and R. Whittington. London: Sage.
- Dierickx, I., and K. Cool. 1989. Asset stock accumulation and sustainability of competitive advantage. *Management Science* 35: 1504–1511.
- Foss, N.J., and T. Knudsen. 2003. The resource-based tangle: Towards a sustainable explanation of competitive advantage. *Managerial and Decision Economics* 24: 291–307.
- Makadok, R. 2001. Toward a synthesis of the resource-based and dynamic-capability views of rent creation. *Strategic Management Journal* 22: 387–401.
- Pacheco-de-Almeida, G., and P. Zemsky. 2003. The effect of time-to-build on strategic investment under uncertainty. *RAND Journal of Economics* 34: 166–182.
- Pacheco-de-Almeida, G., and P. Zemsky. 2007. The timing of resource development and sustainable competitive advantage. *Management Science* 53: 651–666.
- Peteraf, M.A. 1993. The cornerstones of competitive advantage: A resource-based view. *Strategic Management Journal* 14: 179–191.
- Urban, G., and J. Hauser. 1990. *Design and marketing of new products*. Englewood Cliffs: Prentice Hall.
- Vermeulen, F. 2009. Slow and steady wins the growth race. HBR blogs.hbr.org, 20 February. Available at <http://blogs.hbr.org/vermeulen/2009/02/slow-and-steady-wins-the-growth.html>. Accessed 26 Feb 2013.
- Wernerfelt, B. 1984. A resource-based view of the firm. *Strategic Management Journal* 5: 171–180.

Disruptive Technology

Henry Lucas

University of Maryland, Robert H. Smith School of Business, College Park, MD, USA

Abstract

An innovator develops a new technology which threatens the incumbents in a field. This new innovation proves disruptive to products, services and/or markets, creating major challenges for incumbent firms. In many instances the incumbents fail to adapt to disruptive technologies and are bought by or merged with another firm, or declare bankruptcy.

Definition A disruptive technology creates business processes and values that are fundamentally different from existing technologies. The disruptive technology's value proposition for customers is so overwhelming that they rapidly abandon existing markets, which tend to quickly collapse as a result.

Disruptive technologies present a major challenge to management, which has to recognize the emergence and threat of a new technology and develop a strategy to respond to it. The costs of failing to respond are quite high, with firms and entire

industries disappearing due to disruptive technologies. Innovators have created disruptions for decades, but the rise of information technologies since the 1950s, and especially the Internet since 1995, have accelerated the pace of change.

Examples

A successful innovation is very likely to be disruptive for incumbents in a marketplace. Examples of disruptive technologies include:

| Disruptive technology | Incumbent |
|----------------------------|------------------------------|
| The telegraph | The pony express |
| Railways | Wagon and canal freight |
| Electricity | Water power |
| Aeroplanes | Railway passenger service |
| Jet planes | Propeller aircraft, airlines |
| Digital photography | Kodak |
| News websites and blogs | Newspapers |
| e-book readers and books | Borders |
| DVDs by mail and streaming | Blockbuster |
| Google | Print, TV, radio advertising |

Some of the innovations described above had an immediate impact on markets while others took some time. For example, the telegraph shut down the pony express almost immediately upon its completion from the east to the west coasts, while it took several years for the Netflix model of distributing video content to force Blockbuster into bankruptcy.

Origins

Some credit Christensen (1997) with creating the term ‘disruptive technology’, and certainly his work has popularized the concept. Economic historians such as David (1985) have written about new technologies, and management scholars have looked at the impact of technological change on companies and industries (Tushman and Anderson 1986; Romanelli and Tushman 1994). David’s analysis of the application of electricity

in manufacturing is particularly insightful and offers an interesting analogy to the growth of personal computing in organizations (David 2002).

The concept of ‘punctuated equilibrium’, which has been described in several different fields, can be applied to technological change in business (Tushman and Anderson 1986). The basic idea is that industries remain in equilibrium until there is a significant new technology which creates a shock. Successful firms respond to the new, potentially disruptive technology, and the industry moves to a new level, where it remains in equilibrium for some time. Tushman and Anderson distinguish between two kinds of technological change, those that are competence-enhancing and those that are competence-destroying. A competence-enhancing technology is one which an incumbent is able to take advantage of because it has the basic skills to respond. Competence-destroying innovations are those that the incumbent organization is incapable of adopting. Jet aircraft were competence-enhancing for the airlines because, while larger, cheaper to operate and faster than propeller aircraft, they fulfilled the same function, and training employees to adopt them was straightforward. DVDs by mail turned out to be competence-destroying for Blockbuster as it was unable to mount a successful mail order operation or establish a business to stream video over the Internet.

Strategy and Management

Christensen argues that firms develop management systems that discourage a positive response to a new innovation. Existing customers do not demand the innovation, so the firm continues business as usual while the innovator establishes a market. Lucas and Goh (2009) also emphasize the strategic and management challenges of disruptive technologies in their study of Kodak. Kodak was the leading firm in the photography business for decades, with a market share of over 90% at one point. While senior management saw the threat of digital photography, it failed to develop a coherent strategy to respond, spending

billions on various digital projects that did not succeed in the marketplace. Senior management was also unable to convince middle managers of the need to shift to a digital strategy; these managers were steeped in the analog, chemical process of making and selling film. The results of this technological disruption have been disastrous for Kodak; its sales and stock prices have plummeted to less than a \$1 per share and employment is down by over 100,000 people from its peak. In early 2012 Kodak filed for bankruptcy.

Research

Research on disruptive technologies by nature must focus on individual companies and industries, which tends to rule out broad-based survey research. Many of the disruptions are unique, so the researcher has to look for patterns of actions in response to a disruption (see Lucas 2012). There is little strong theory to guide research and much of the work is purely descriptive. The challenge for the future is to develop better theories of technological disruption, which will guide research to both identify and cope with disruptions. With the rapid pace of technological change and the explosive growth of innovations, especially with information technologies and the Internet, the need for such theories and research is pressing.

See Also

- ▶ [Competitive Advantage](#)
- ▶ [Innovation Strategies](#)

References

- Christensen, C. 1997. *The innovator's dilemma*. Boston: Harvard Business School Press.
- David, P. 1985. Clio and the economics of QWERTY. *American Economic Review* 75: 332–337.
- David, P. 2002. Understanding digital technology's evolution and the path of measured productivity growth: Present and future in the mirror of the past. In *Understanding the digital economy: Data, tools and research*, ed. E. Brynjolfsson and B. Kahin. Cambridge, MA: The MIT Press.

- Lucas Jr., H.C. 2012. *The search for survival: Lessons from disruptive technologies*. Westport: Praeger.
- Lucas Jr., H.C., and J.M. Goh. 2009. Disruptive technology: How Kodak missed the digital photography revolution. *Journal of Strategic Information Systems* 18: 46–55.
- Romanelli, E., and M. Tushman. 1994. Organizational transformation as punctuated equilibrium: An empirical test. *Academy of Management Journal* 37: 1141–1166.
- Tushman, M., and P. Anderson. 1986. Technological discontinuities and organizational environments. *Administrative Science Quarterly* 32: 439–465.

Distant Search

Riitta Katila and Sruthi Thatchenkery
Stanford University, Stanford, CA, USA

Definition Distant search is problem-solving outside the neighbourhood of what is already known. Definitions of distance vary. For some authors, an organization that searches distally solves problems by using knowledge that is new to it. For others, organizations that engage in distant search use knowledge that is very different in several dimensions from what has been used before to solve similar problems.

Distant search is problem-solving outside the neighbourhood of what is already known. Definitions of distance vary. For some authors, an organization that searches distantly solves problems by using knowledge that is new to it. For others, organizations that engage in distant search use knowledge that is very different in several dimensions from what has been used before to solve similar problems. Overall, research finds that organizations that primarily engage in distant search are good at discovering new solutions and adapting to a changing environment.

Unlike ▶ [local search](#), distant search is irregular, unpredictable and therefore more challenging. Such search typically requires firms to work with new combinations of knowledge elements, new principles of recombining, and possibly with new

organizations with different expectations and norms; in other words, it involves a ‘conscious effort to move away from current organizational routines and knowledge bases’ (Katila and Ahuja 2002: 1184).

There are multiple *drivers* for distant search. One stream of research claims that technology factors such as technological puzzles, reverse salients (Ahuja and Katila 2004) and outright failure (March and Simon 1958) drive firms to distant search – often simply because firms have exhausted the local opportunities to solve problems. Another stream argues that firms engage in distant search if they perceive that the inherent risks related to distance are lower because they have prominent third-party partners (Hallen et al. 2012) or because they have ‘safety in numbers’ due to bandwagon effects (Sorenson and Stuart 2008). A third stream highlights boundary-spanning mechanisms as factors driving searchers away from local and towards distant search, including decentralized decision-making, inventor mobility and interfirm relationships.

There are several significant *outcomes*. On the one hand, because distant search involves knowledge that is new to the firm, its outcomes are often highly variable, and returns often uncertain, unreliable and slow to emerge. On the other hand, distant search can change firm performance in a fundamental way because it brings in new knowledge, and can even help improve the searcher’s fundamental understanding of the structure of the knowledge landscape such as cause–effect relationships (Ahuja and Katila 2004). And when distant search succeeds, the outcomes can be breakthroughs. Empirical evidence confirms that distant (rather than local) search results in radically improved new products (Katila and Chen 2008) and brings new ways of perceiving managerial challenges (Miller et al. 2007). More infrequently, distant search can also become ‘too much of a good thing’. If the firm spends too much time ‘in transit’, making long jumps to unrelated peaks but never stopping to develop the knowledge that was acquired, it may experience the costs but never the benefits of distant search.

Current and future *research directions* have drawn attention to new ways of thinking about and defining ‘distance’. For example, Katila and Chen (2008) show that firms innovate more effectively when they avoid synchronizing their search with rivals. Thus, it matters less whether knowledge is new or familiar to the firm: what does matter is distance (uniqueness) vis-à-vis rivals. Other recent work has highlighted the intriguing possibility that research may have undervalued the capacity of organizations to explore. Li and colleagues (2013) note that, ‘the search literature does not reflect important research on cognitive processes ... and in general the capacity of humans to be curious and to pay particular attention to distinctively different, salient and novel information’, suggesting that distant search may arise from human curiosity to explore the unknown. So, rather than portray distant search as a difficult goal for most organizations, given appropriate permission we may be more likely to explore than is commonly thought. Finally, research has become increasingly concerned about distant search under different temporal and environmental conditions (Sorenson and Stuart 2008; Chen et al. 2010; Katila et al. 2012), presenting an intriguing direction for future work.

See Also

► [Local Search](#)

References

- Ahuja, G., and R. Katila. 2004. Where do resources come from? The role of idiosyncratic situations. *Strategic Management Journal* 25: 887–907.
- Chen, E., R. Katila, R. McDonald, and K. Eisenhardt. 2010. Life in the fast lane: Origins of competitive interaction in new vs. established markets. *Strategic Management Journal* 31: 1527–1547.
- Hallen, B., R. Katila, and J. Rosenberger. 2012. Unpacking the effects of social defenses: The formation of corporate venture capital relationships. Working paper, Stanford University.
- Katila, R., and G. Ahuja. 2002. Something old, something new: A longitudinal study of search behavior and new product introduction. *Academy of Management Journal* 45: 1183–1194.

- Katila, R., and E.L. Chen. 2008. Effects of search timing on innovation: The value of not being in sync with rivals. *Administrative Science Quarterly* 53: 593–625.
- Katila, R., E. Chen, and H. Piezunka. 2012. All the right moves: How entrepreneurial firms compete effectively. *Strategic Entrepreneurship Journal* 6: 116–132.
- Li, Q., K. Smith, P. Maggitti, P. Tesluk, and R. Katila. 2013. Top management attention to innovation: The role of search selection and intensity in new product introductions. *Academy of Management Journal* 56: 893–916.
- March, J., and H. Simon. 1958. *Organizations*. New York: Wiley.
- Miller, D., M. Fern, and L. Cardinal. 2007. The use of knowledge for technological innovation within the diversified firm. *Academy of Management Journal* 50: 308–326.
- Sorenson, O., and T. Stuart. 2008. Bringing the context back in: Settings and the search for syndicate partners in venture capital investing. *Administrative Science Quarterly* 53: 266–294.

Diversification

David J. Teece
 Berkeley Research Group, LLC, Emeryville,
 CA, USA
 Haas School of Business, University of
 California, Berkeley, Berkeley, CA, USA

Abstract

Diversification is the act of expanding a firm's business into new product, geographic or vertical markets. Lateral diversification involves some degree of relatedness; conglomerate diversification involves none. The Penrosean resource-based view accounts for diversification as a process of firm growth driven by the opportunity to deploy excess resources into new, but still related, lines of business. The results of empirical research are consistent with a resource-driven view of diversification and growth.

Definition Diversification occurs when a company enters one or more additional markets or market segments. Diversification typically requires a company to expand its skill base and other assets.

Diversification can occur in a number of dimensions, including product markets, geographic markets and vertical markets.

Product market diversification takes place when a company chooses to offer new products or services that involve market segments other than those in which it is currently active. The new activities may or may not share common inputs with existing activities. In the case of lateral diversification, the activities are related, as in the example of a luxury handbag vendor that expands into jewellery (which share a common customer base). In conglomerate diversification, the new and existing activities share nothing but financial monitoring by a head office.

Geographic market diversification takes place when a company takes a product offered in one geographic market and begins to offer it in another. This could occur between regions, within a large country or across national borders. An example of this would be a European manufacturer that decides to open a subsidiary in Asia to pursue sales opportunities there.

Diversification into activities that are upstream or downstream from existing production is called ► [vertical integration](#). An example would be a company that assembles televisions deciding that it needs to produce the display component in order to develop differentiating technology or to develop its own chain of retail outlets to better inform potential customers. This may not commonly be thought of as diversification, but in essence it is. A company that diversifies into an upstream input may or may not sell some of that input to other firms.

Conglomerate Diversification

Diversification into unrelated activities is commonly called conglomerate diversification. Conglomerate diversification, some within holding company structures, became popular in the United States in the 1960s. Proponents argued that synergies would emerge among the acquired companies and/or that ► [conglomerates](#) provided shareholders with instant risk diversification. Analysis suggests that many conglomerate mergers were initiated as defensive moves by

companies with below-average profits facing demand instability or other uncertainty in their original industry, combined with a belief that a manager armed with financial planning capabilities can successfully manage any business (Weston and Mansinghka 1971).

Oliver Williamson argued that the conglomerate form of diversification ‘can have beneficial effects in goal pursuit, monitoring, staffing, and resource allocation’ as long as the diversification is not so extreme that top management ‘cannot competently evaluate and allocate funds among the diverse activities in which it is engaged’ (Williamson 1981: 1559). The benefits accrue because the conglomerate is an extension of the M-form model of organization and provides a ‘miniature capital market’ (p. 1556) in which the managers of each line of business compete for resources. Top management can direct capital to the most promising investment opportunities in its portfolio. Because of the informational advantages of internal organization, this allocation process can be more efficient than the finance outcomes in external capital markets, where investors and bankers lack access to direct knowledge about the relationship of each business unit to its market environment.

Although a few conglomerates, such as General Electric, performed reasonably well, many others ran into trouble. The leveraged buyout wave of the 1980s was fuelled in part by the need of conglomerates to unload their less profitable divisions. Today, more companies choose to remain focused and somewhat specialized rather than pursuing unrelated diversification. A notable exception occurs in developing countries, where business groups (often family-run) become involved in a wide range of industrial activities. This may be a response to the unique institutional conditions in these countries, where personal contacts can be more important than industrial capabilities and global competition may be dampened by trade barriers (Kock and Guillén 2001).

Diversification and Growth

One of the earliest theories of the (non-conglomerate) diversification process was put

forward by Penrose (1959). Penrose conceived of firms as ‘a collection of productive resources’ (p. 24), both physical and human, the services of which are inputs to the production process. Moreover, ‘the final products being produced by a firm at any given time merely represent one of several ways in which the firm could be using its resources’ (p. 149). In other words, the services rendered by a firm’s resources are fungible and not generally limited to the production of a single product or service.

As the firm progresses with its current production plan, its resources, particularly its managerial resources, accumulate know-how that could usefully be redeployed. These ‘unused abilities’ (Penrose 1959: 54) both create the opportunity for, and limit the extent of, diversification into new markets. Penrose thus provides one of the first models of an internally driven growth dynamic.

The notion that excess resources lead management to pursue diversification receives support from historical accounts. The 1930s Depression triggered the first great wave of diversification among a group of technologically advanced companies. As Chandler observed:

Precisely because these firms had accumulated vast resources ... their executives were under even greater pressure than those of smaller firms to find new markets as the old ones ceased to grow ... General Electric and Westinghouse – which had concentrated primarily on the manufacture of light and power equipment, diversified into production of a wide variety of household appliances ... General Motors ... moved into diesels, appliances, tractors, and airplanes. (Chandler 1969: 275)

Penrose saw the ongoing expansion of total long-run profits as the main motivation behind managers’ drive to diversify. A variation of her excess resource approach can be found in the ► [managerial discretion](#) literature (Marris 1964; Mueller 1969). In this model, managers lead their firms to diversify as a means of self-aggrandizement and firms maximize growth, but not necessarily profits. Some of the conglomerate diversification in the United States during the 1960s may have fitted this pattern.

The key notion underlying the Penrosean approach is that some of the services of a firm’s

resources may be underutilized and hence available to apply to new productive activities. Resources are firm-specific assets that are difficult, or impossible, to imitate. They can be tangible but are more likely to be intangible. Examples include intellectual property, process know-how, customer relationships and the knowledge possessed collectively by groups of skilled employees. Organizational knowledge, while firm-specific, is seldom limited only to the products and processes with which it is actively involved (Teece 1982).

One implication of the resource-based approach to diversification is that there should be some relationship between the divisions of a diversified company. This may not apply to all the divisions viewed together, but it should apply to subgroups among them. This type of coherent diversification can arise when firms undergo successive lateral diversifications that each build on a different set of excess resources. In this approach, ‘coherence increases as the number of common technological and market characteristics found in each product line increases’ (Teece et al. 1994: 4). At the extreme of incoherence, technical and market characteristics would be distributed randomly across a firm’s lines of business.

Although Penrose’s ideas found some uptake in the economics literature (see, e.g., Rubin 1973), the industrial organization literature on diversification, to the extent that there is one, is dominated by a neoclassical approach based on economies of scope (e.g., Panzar and Willig 1981).

Teece (1980, 1982) argued that, in a reasonably well-functioning market economy, the ► **multi-product companies** could not be explained solely by reference to a neoclassical cost function. While economies of scope explain joint production, they do not explain why joint production must be organized within a single multiproduct enterprise rather than in multiple organizations sharing resources within a contractual arrangement.

What makes such arrangements impractical is the presence of know-how among the resources. Many types of know-how are costly to transfer and difficult to specify in a contract (Teece 1977). The transaction costs associated with contracting

for proprietary know-how account, in large part, for the need to diversify within a single firm rather than through a market arrangement.

Empirical Research: Diversification and Corporate Coherence

In practice, many different types of diversified companies exist. In order to develop a useful theory of diversification, efforts have been made to measure the inter-business relatedness of diversified corporations. But the challenges are significant.

One approach, developed by Caves (1981), is to use the hierarchy implicit in the SIC system (Standard Industrial Classification system; the predecessor to NAICS), so that businesses in different four-digit industries but the same three-digit industry are 1 ‘unit’ apart, whereas businesses whose closest connection is their two-digit industry memberships are 2 ‘units’ apart, and so forth. Lemelin (1982) measured inter-industry relatedness as the correlation coefficient across input structures taken from the input-output table. Klavans’ (1989) index of technology relatedness is also based on input patterns, but he uses the amount of overlap in occupational categories as an index. A fairly noisy measure of relatedness has been developed by Gollop and Monahan (1989), who compute the dissimilarity between the patterns of input shares, using nine classes of input (i.e., production wages, fuel, purchased services and so on). Working with Census of Manufacturers data, they argue that because the data are ‘filtered through the SIC system, the underlying notion of product dissimilarity must have a supply-side orientation . . . differences in distribution systems and/or marketing patterns are ignored. It follows that the formulation of product heterogeneity must be based wholly on technical considerations’ (Gollop and Monahan 1989: 4).

Teece and colleagues (1994) developed an index using SIC data that went beyond input considerations and overturns Gollop and Monahan’s dictum. This was accomplished by moving away from measuring the properties of SIC industries, and instead looking at the frequencies with which

they are combined in firms. Using their measure of coherence on a sample of US corporations, Teece and colleagues (1994) found that as firms grow more diverse, the overall coherence of each firm does not change much, but that there are large differences in coherence among firms. They found that ‘coherent diversifiers’ were the most common corporate mode in their sample.

Resource-based measures of diversification have also been developed. The industries into which a firm has diversified can be related by technology, supply base, skill base, physical asset base, customer base, management knowledge or, more likely, some combination. Different types of relatedness appear to have different performance effects (Pehrsson 2006).

The Caves measures of diversification are the ones most often used in empirical research on diversification. A few studies have used them to explore the implications of the Penrosean (resource-based) approach to diversification.

Chatterjee and Wernerfelt (1991) showed that the nature of a firm’s resources affected its type of diversification. Excess physical and knowledge-based resources were more likely to be associated with related diversification, while excess internal financial resources are associated with more unrelated diversification.

If a firm’s unique resources are strongly adapted to their initial use, then they may prove to be worth less and less as they are applied ‘farther’ away. Montgomery and Wernerfelt (1988) confirmed that firms tend to earn lower rents the ‘farther’ they diversify, measured in terms of the grouping of their business according to two- and three-digit SIC categories.

The empirical research strongly supports the notion that know-how is the key to understanding enterprise diversification and growth.

Empirical Research: Diversification and Performance

Empirically, some diversification – especially into related industries – appears to improve performance as measured by various accounting indicators. However, as the diversification spreads into

still more industries, performance begins to decline. This inverted-U shape may reflect the fact that continued expansion into new industries will eventually render top management less able to control and integrate its operations effectively (Palich et al. 2000).

A more controversial claim involves whether diversification is, on average, an inefficient use of firm resources. A number of studies using comparisons with non-diversified firms have found that diversification, broadly defined, often destroys value. If true, this result would tend to support the ‘managerial discretion’ theory that diversification is an agency problem between managers and shareholders. Most studies in this line of research do find that diversified firms perform worse than specialized firms in the same industries, based on comparisons of market value to a hypothetical non-diversified value constructed from the median market values of single-industry firms in the relevant industries.

It has been argued, however, that the bundle of specialized firms is not a valid point of comparison. A few studies (e.g., Campa and Kedia 2002) showed that the diversification discount becomes insignificant once the self-selection of firms that diversify and the firms they acquire has been controlled for. The result suggests that firms are most likely to diversify or merge when they are weak to begin with or under duress of some kind. This accords with the Depression case history evidence cited earlier.

However, in a more recent study, with access to additional years of data, Hoehle and colleagues (2012) found a large and significant valuation discount for diversified firms even after applying a self-selection method similar to that of Campa and Kedia (2002). They also showed that as much as one-third of the discount can be explained by a set of 14 measures of the quality of corporate governance, once again raising the possibility that diversification results, on average, from inefficient investment choices by management.

Yet the existence of a ‘diversification discount’ remains an unresolved point open to various critiques. The segment data in COMPUSTAT, on which all of these studies have been based, may

be ‘causing’ the diversification discount with measurement error. A study that used establishment-level data from the Census Bureau to derive a more accurate measure of diversification found a diversification *premium* instead of a discount (Villalonga 2004). Another study explored evidence that stock market investors might value any group of single-industry firms more highly than a diversified firm with equivalent cash flow, a result that separates the diversification discount from any management implications (Mitton and Vorkink 2010).

In the end, the empirical facts about the performance of diversified firms, on average, will not matter to individual management teams making investment choices. There will always be entrepreneurial managers who identify or create profitable opportunities for their firms to diversify.

See Also

- ▶ Conglomerates
- ▶ Economies of Scale
- ▶ Managerial Discretion
- ▶ M-Form Firms
- ▶ Multiproduct Companies
- ▶ Penrose, Edith T. (1914–1996)
- ▶ Scope Economies
- ▶ Vertical Integration

References

- Campa, J.M., and S. Kedia. 2002. Explaining the diversification discount. *Journal of Finance* 57: 1731–1762.
- Caves, R.E. 1981. Diversification and seller concentration: Evidence from changes. *Review of Economics and Statistics* 63: 289–293.
- Chandler, A.D. 1969. The structure of American industry in the twentieth century: A historical overview. *Business History Review* 43: 255–298.
- Chatterjee, S., and B. Wernerfelt. 1991. The link between resources and type of diversification: Theory and evidence. *Strategic Management Journal* 12: 33–48.
- Gollop, F.M., and J.L. Monahan. 1989. *From homogeneity to heterogeneity: An index of diversification*, Technical paper No. 60. Washington, DC: U.S. Department of Commerce, Bureau of the Census.
- Hoechle, D., M. Schmid, I. Walter, and D. Yermack. 2012. How much of the diversification discount can be explained by poor corporate governance? *Journal of Financial Economics* 103: 41–60.
- Klavans, R. 1989. *Business relatedness and business performance*, FTC Line of Business Program Research paper No. 83. Washington, DC: Federal Trade Commission.
- Kock, C.J., and M.F. Guillén. 2001. Strategy and structure in developing countries: Business groups as an evolutionary response to opportunities for unrelated diversification. *Industrial and Corporate Change* 10: 77–113.
- Lemelin, A. 1982. Relatedness in the patterns of interindustry diversification. *Review of Economics and Statistics* 64: 646–657.
- Marris, R. 1964. *The economic theory of ‘Managerial’ capitalism*. London: Macmillan.
- Mitton, T., and K. Vorkink. 2010. Why do firms with diversification discounts have higher expected returns? *Journal of Financial and Quantitative Analysis* 45: 1367–1390.
- Montgomery, C.A., and B. Wernerfelt. 1988. Diversification, Ricardian rents, and Tobin’s q. *RAND Journal of Economics* 19: 623–632.
- Mueller, D.C. 1969. A theory of conglomerate mergers. *Quarterly Journal of Economics* 83: 643–659.
- Palich, L.E., L.B. Cardinal, and C.C. Miller. 2000. Curvilinearity in the diversification–performance linkage: An examination of over three decades of research. *Strategic Management Journal* 21: 155–174.
- Panzar, J.C., and R.D. Willig. 1981. Economies of scope. *American Economic Review* 71: 268–272.
- Pehrsson, A. 2006. Business relatedness and performance: A study of managerial perceptions. *Strategic Management Journal* 27: 265–282.
- Penrose, E.T. 1959. *The theory of the growth of the firm*. London: Oxford University Press.
- Rubin, P.H. 1973. The expansion of firms. *Journal of Political Economy* 81: 936–949.
- Teece, D.J. 1977. Technology transfer by multinational firms: The resource cost of transferring technological know-how. *The Economic Journal* 87: 242–261.
- Teece, D.J. 1980. Economies of scope and the scope of the enterprise. *Journal of Economic Behavior & Organization* 1: 223–247.
- Teece, D.J. 1982. Towards an economic theory of the multiproduct firm. *Journal of Economic Behavior & Organization* 3: 39–63.
- Teece, D.J., R. Rumelt, G. Dosi, and S. Winter. 1994. Understanding corporate coherence: Theory and evidence. *Journal of Economic Behavior & Organization* 23: 1–30.
- Villalonga, B. 2004. Diversification discount or premium? New evidence from the business information tracking series. *Journal of Finance* 59: 479–506.
- Weston, F.F., and S.K. Mansinghka. 1971. Tests of the efficiency performance of conglomerate firms. *Journal of Finance* 26: 919–936.
- Williamson, O.E. 1981. The modern corporation: Origins, evolution, attributes. *Journal of Economic Literature* 19: 1537–1568.

Dominant Design

Pek-Hooi Soh

Simon Fraser University, Beedie School of Business, Vancouver, BC, Canada

Abstract

The notion of dominant designs in a product class has been used by scholars and practitioners of technology management to illustrate a set of product design features that emerge and achieve wide acceptance in a new product market. The emergence of a dominant design occurs during the period in which new combinations of ideas, knowledge and resources are being created and contested by many new entrants in a new product market. During the race to define a dominant design, a firm's survival is thus dependent upon the successful alignment of the firm's product strategy with rapidly evolving market requirements.

Definition A dominant design in a product class refers to a set of product design features that achieve a de facto standard in a new product market.

What Is a Dominant Design?

The dominant design in a product class or product generation refers to a set of product design features that emerge and win the dominant acceptance in a new product market. It is a de facto standard that competing firms must adhere to if they hope to grow and sustain their competitive advantage in the new product market. The emergence of a dominant design occurs during the period in which new combinations of ideas, knowledge and resources are being created and contested by many new entrants in the market. These new entrants include entrepreneurial startups, incumbent firms in the original product market, as well as firms that are diversifying in relation to related product markets.

In an emerging product market, firms compete on novel and unique design dimensions in new

► [product innovation](#) and are faced with high technical and market uncertainty. Therefore, during the race to define a dominant design, a firm's survival is dependent upon the successful alignment of the firm's product strategy with rapidly evolving market requirements. Such alignment can be realized through communication with stakeholders such as complementary asset owners, product users, regulatory bodies and standards-setting committees, as well as via strategic manoeuvring in the alliance networks of producers. Once a dominant design is established, firms focus their resources on refining technical skills and achieving production efficiency while making incremental product innovation along the set of widely accepted product design features. Some examples of dominant designs are aircrafts, cars with internal combustion engines, IBM personal computers, VHS standards in home video recorders, flight simulators, hard disk drives and smartphones with combined features of a personal digital assistance (PDA) and a camera phone.

The Origin of Dominant Designs

The concept of dominant designs was first developed and introduced in the management literature by William Abernathy and ► [james utterback](#) (Utterback and Abernathy 1975; Abernathy and Utterback 1978). Using the findings of earlier innovation studies, Abernathy and Utterback argue that the evolution of a radically new product and its associated production process reveals a consistent pattern of shifts in market competition and organization forms across a large number of product categories, ranging from semiconductors, cars and aircraft to typewriters and light bulbs. In the product lifecycle, the occurrence of a dominant design is a watershed event that marks the end of technological discontinuities as characterized by multiple competing product designs and the beginning of incremental technological progress. As discontinuous change in product innovation evolves into incremental product innovation, market competition shifts from the entry of many small firms with varieties of

product designs to the consolidation of firms whose products reflect the synthesis of prior designs from individual product innovations that have appealed to many different users. During this transition period, organizations transform from a flexible, organic system that is highly adaptable to changing market conditions to an efficient, formalized system that enforces scale economies and standardization in the production process via highly specialized managerial functions and equipment.

Accordingly, the evolution of technology (or the product lifecycle) is tightly linked to the emergence of a dominant design, such that the underlying ► [technological change](#) lead to the dominance of a particular technological trajectory among competing design paths. Furthermore, the dominant design of an industry has the power of locking out alternative product designs, resulting in the exit of firms whose competencies are entrenched in these unsupported design paths. As such, the lifecycle of an industry is also marked by the same events that attempt to influence the adoption of a set of product design features as dominant.

The seminal works of Abernathy and Utterback shed light on two important linkages in the evolution of technology. One is the dynamic link between product and process innovation and the entry and exit of firms in an industry. The other is that an established dominant design serves as an important guidepost for future technology investments along a technological trajectory, shaping firm strategies and performance. The rise of new product innovations is influenced by the interactions between technology push factors and market pull factors at any particular time. Within a technology lifecycle, a firm's selection decision over the multitude of choices in each product design can be constrained by prior technical decisions and by the evolution of user choices, creating economic trade-offs in knowledge search and resource allocation that follow a particular design hierarchy (Clark 1985). Thus, a dominant design represents the confluence of technical possibilities, design choices and user preferences across product variations introduced by different

firms, creating the momentum of technical progress and irreversibility of investment decisions (Utterback 1994).

Identifying Dominant Designs

Several techniques have been used to determine the emergence of dominant designs. For instance, Suárez and Utterback (1995) asked industry experts to identify the dominant product for a particular product class, and the date or year when such product dominance was widely recognized. By contrast, Tushman and Anderson (1986) identified the year in which the product market reached its peak sales for a particular dominant product during the technology lifecycle. A dominant design need not necessarily embody the most superior technical elements, although its occurrence may potentially destroy the competencies of incumbent firms in an established industry (Tushman and Anderson 1986).

In a more systematic approach, Christensen et al. (1998) demonstrated that the emergence of a dominant design can be traced to the evolution of component technologies and the process whereby their interface arrangements and technical interactions conform to particular design solutions within an architectural framework. For example, in the rigid disk drive industry, the Winchester drive architecture and intelligent electronic interfaces were two architectural designs that were increasingly embodied in new products introduced by new entrants in a pre-dominant design period (Christensen et al. 1998). In contrast to identifying the traits of an architectural system, Burg and Kenney (2003) documented the development of two competing data communications technologies and showed how the dynamics of competition and cooperation arising from within and between the communities of producers and suppliers had tipped the market in favour of the technology adhered to by the larger, more diversified community. These studies show that the factors that powerfully influence the selection of a dominant design in an industry are also the factors that drive the industry shakeout of producers.

Strategic Implications of Dominant Designs

The notion of dominant designs has been influential in the field of strategic management of technological innovation. First, it separates the periods of normal technical progress or incremental innovations from technological discontinuities. Second, it focuses on technological change as a central force in shaping the competitive environments and organizational forms. Third, it sheds light on the endogenous relations between strategic decisions made by individual firms and the momentum of technological change, suggesting a dynamic approach to the theory of innovation and change. In the light of these implications, when and how firms enter into an emerging technology field and compete with new product variations will affect their survival (Teece 1986; Utterback 1994; Suárez and Utterback 1995; Christensen et al. 1998; Tegarden et al. 1999; Schilling 2002).

Several scholars have raised concerns with regard to the validity of the dominant design model in linking technology evolution to industry lifecycle (Rosenkopf and Tushman 1994; Van de Ven and Garud 1994; Klepper 1996; Klepper and Simons 2000). Based on the theories of evolutionary economics and industrial organization, Klepper (1996) argues that the shakeout of industry evolution is the consequence of firms' R&D decisions rather than the occurrence of a dominant design. Accordingly, the rise and fall of product and process innovation rates in the product lifecycle model can be explained by the relative advantages of incumbent firms versus new entrants in their distinctive capabilities, R&D efforts as well as pre-entry experiences (Klepper 1996; Klepper and Simons 2000).

From an organizational evolution perspective, Rosenkopf and Tushman (1994) argue that the development of a dominant design is influenced more by socio-economic factors than by technical logic. They posit that inter-organizational dynamics within a technological community can be a powerful mechanism that creates a negotiated order among certain members of the community, who develop systemic interdependencies that

retain a preferred technical system while discarding others who cannot converge on the same design. A technological community may consist of coalitions of firms, regulatory and standards bodies, professional associations, government agencies and other institutions. In the same vein, Van de Ven and Garud (1994) stress that the mechanisms culminated from the social and institutional processes during the period of technological discontinuities would become not only the selection criteria for a technical solution as a dominant design but also the inertia forces for retaining the same technical and institutional forms until the next technological discontinuity occurs.

Taken together, when and how a dominant design is established cannot be judged through simple technical choices made by individual firms in response to user preferences. In more recent studies, technology management researchers depict dominant designs as an architectural system consisting of subsystems and/or components whose dominance in the market can be shaped by a multitude of factors, including the properties of technology, interactions between producers and suppliers, standards-setting process, market competition and increasing returns to user adoption (Soh and Roberts 2003; Murmann and Frenken 2006; Srinivasan et al. 2006).

In furthering our understanding of managing technological discontinuities, Schilling (2002) proposes a framework of technological lockout factors arising from internal organization (for example, core capabilities, absorptive capacity and marketing) and external environment (for example, effectiveness of intellectual property protection, network externalities, access to complementary assets, market uncertainty). Without a good understanding of these internal and external factors, firms face a higher risk of being locked out from the evolution of technology. To illustrate the influential role of producers, Soh (2010) demonstrates that firms that promote a set of standard design features for a technology can configure their alliance networks in order to garner the support of suppliers of complementary components and direct market resources away from competing standards. This is an essential firm networking

process for enforcing positive feedback about adopting the preferred technology standard.

Despite the heightened uncertainty a myriad of possible events create during technological discontinuities, it is imperative that firms' management understand the relative advantages possessed by de nova firms and incumbent firms and make appropriate investments in their core capabilities and human resources so as to align their ► [technology strategy](#) with the underlying conditions of discontinuous change (Teece 1986; Utterback 1994).

See Also

- [Product Innovation](#)
- [Technological Change](#)
- [Technology Strategy](#)
- [Utterback, James M. \(Born 1941\)](#)

References

- Abernathy, W., and J.M. Utterback. 1978. Patterns of industrial innovation. *Technology Review* 80: 97–107.
- Burg, U.V., and M. Kenney. 2003. Sponsors, communities, and standards: Ethernet vs. token ring in the local area networking business. *Industry and Innovation* 10: 351–375.
- Christensen, C.M., F.F. Suárez, and J.M. Utterback. 1998. Strategies for survival in fast-changing industries. *Management Science* 44: S207–S220.
- Clark, K.B. 1985. The interaction of design hierarchies and market concepts in technological evolution. *Research Policy* 14: 235–251.
- Klepper, S. 1996. Entry, exit, growth and innovation over the product life cycle. *American Economic Review* 86: 562–583.
- Klepper, S., and K.L. Simons. 2000. Dominance by birth-right: Entry of prior radio producers and competitive ramifications in the U.S. television receiver industry. *Strategic Management Journal* 21: 997–1016.
- Murmann, J.P., and K. Frenken. 2006. Toward a systematic framework for research on dominant designs, technological innovation, and industrial change. *Research Policy* 35: 925–952.
- Rosenkopf, L., and M. Tushman. 1994. The coevolution of technology and organization. In *Evolutionary dynamics of organizations*, ed. J.A.C. Baum and J.V. Singh. Oxford: Oxford University Press.
- Schilling, M.A. 2002. Technology success and failure in winner-take-all markets: The impact of learning orientation, timing and network externalities. *Academy of Management Journal* 45: 387–398.
- Soh, P.H. 2010. Network patterns and competitive advantage before the emergence of a dominant design. *Strategic Management Journal* 31: 438–461.
- Soh, P.H., and E.B. Roberts. 2003. Network of innovators: A longitudinal perspective. *Research Policy* 32: 1569–1588.
- Srinivasan, R., G.L. Lilien, and A. Rangaswamy. 2006. The emergence of dominant designs. *Journal of Marketing* 70: 1–17.
- Suárez, F.F., and J.M. Utterback. 1995. Dominant designs and the survival of firms. *Strategic Management Journal* 16: 415–430.
- Teece, D.J. 1986. Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. *Research Policy* 15: 285–305.
- Tegarden, L.F., D.E. Hatfield, and A.E. Echols. 1999. Doomed from the start: What is the value of selecting a future dominant design? *Strategic Management Journal* 20: 495–518.
- Tushman, M.L., and P. Anderson. 1986. Technological discontinuities and organizational environments. *Administrative Science Quarterly* 31: 439–465.
- Utterback, J.M. 1994. *Mastering the dynamics of innovation*. Cambridge, MA: Harvard Business School Press.
- Utterback, J.M., and W.J. Abernathy. 1975. A dynamic model of process and product innovation. *Omega* 33: 639–656.
- Van de Ven, A., and R. Garud. 1994. The coevolution of technical and institutional events in the development of an innovation. In *Evolutionary dynamics of organizations*, ed. J.A.C. Baum and J.V. Singh. Oxford: Oxford University Press.

Dominant Logic

Richard A. Bettis¹ and Daniela Blettner²

¹University of North Carolina Chapel Hill, Kenan-Flagler School of Business, Chapel Hill, NC, USA

²Simon Fraser University, Burnaby, Canada

Abstract

This entry provides an overview of dominant logic and discusses recent research developments. Cognitive, behavioural and hybrid approaches to studying dominant logic are discussed. Particular attention is given to the emergence of dominant logic and its effects on strategic action and performance. Finally, we provide suggestions for future research.

Definition Dominant (general management) logic has been defined as ‘the way in which managers conceptualize the business and make critical resource allocation decisions – be it in technology, product development, distribution, advertisement or in human resource management’ (Prahalad and Bettis 1986: 490) and, following from this an ‘information filter’ (Bettis and Prahalad 1995: 7) that defines what is and is not important for managerial attention.

Dominant (general management) logic has been defined as ‘the way in which managers conceptualize the business and make critical resource allocation decisions – be it in technology, product development, distribution, advertisement or in human resource management’ (Prahalad and Bettis 1986: 490) and, following from this, an ‘information filter’ (Bettis and Prahalad 1995: 7) that defines what is and is not important for managerial attention. Dominant logic was introduced into the literature to explain the relationship between diversification and performance (Prahalad and Bettis 1986). However, dominant logic has seen a much broader application in the subsequent literature and has been used to explain a wide variety of strategy actions and outcomes such as acquisitions (Coté et al. 1999), joint venture success (Lampel and Shamsie 2000), corporate strategy (Ray and Chittoor 2005), strategic change (Von Krogh et al. 2000; Jarzabkowski 2001), knowledge management processes (Brännback and Wiklund 2001) and firm performance (Obloj and Pratt 2005; Obloj et al. 2010).

Dominant logic is one specific form of a model in an organization – a largely mental model of strategy shared by the top management team. One other class of models is what are commonly referred to as business models (Baden-Fuller and Morgan 2010; Teece 2010). Business models are often more explicit and codified than dominant logic and are directly related to value propositions. Another strategy model is the kernel of a strategy (Rumelt 2011), which encapsulates the core content of a strategy.

Over time, the underlying epistemological assumptions of dominant logic have evolved (Von Krogh and Ross 1996). Furthermore, the

positive effects of dominant logic as a filter has been contrasted with the more negative effects of dominant logic as a blinder (Prahalad 2004; Bettis et al. 2011).

Operationalization of Dominant Logic

Given the theoretical breadth and richness, the operationalization of dominant logic has been challenging. Some empirical studies on dominant logic emphasize the behavioural aspects of dominant logic. For instance, D’Aveni et al. (2004) associate a congruence of resource allocation among lines of business with efficiency and profitability. Others focus more on the cognitive properties of dominant logic. Ginsberg (1989) sees dominant logic as a mental map and measures it based on two properties: cognitive complexity and cognitive differentiation. Finally, some operationalize dominant logic as a hybrid construct combining cognitive and behavioural aspects. Coté et al. (1999) measure dominant logic using three dimensions: (1) conceptualization of the role of the firm and acquisitions; (2) criteria for choice and evaluation; (3) organizing and management principles. They argued that the consistency among these three dimensions of dominant logic is related to success in acquisitions.

Von Krogh et al. (2000), by contrast, operationalized dominant logic along six dimensions that refer to the internal and external environment (people, culture, product, competitors, customers and technology) and related the breadth of dominant logic to the effectiveness of change. Obloj et al. (2010) take the stance that dominant logic is a system of four elements and found that a high performing dominant logic is related to external opportunity-seeking orientation, proactiveness, organizational learning and (low) codification of routines. These different ways of operationalizing show a clear trend towards multidimensional operationalization. The criteria for a successful dominant logic are related to a particular orientation in the individual dimensions of dominant logic. Even more frequently in more recent research, the success criteria are related to the coherence or consistency between dimensions.

Emergence of Dominant Logic

Given that dominant logic was originally focused on large firms, most empirical studies have focused on studying large, established organizations. However, in such a context, the dominant logic elements become internalized in systems, structure and processes, and are hence no longer directly accessible. Cause-effect relationships are further obstructed by the complexity of large organizations.

Recently, articles have started to explore the emergence of dominant logic in ventures. For instance, Porac et al. (2002) studied dominant logic in software ventures and Obloj et al. (2010) examined the emergence of dominant logic in ventures in a transition economy. The context of entrepreneurial ventures is particularly interesting because it allows how organizations developmental models – how a dominant logic emerges – to be studied.

Different elements of dominant logic develop and increasingly cohere or hang together. In this way the process of establishing coherence among the different elements of a firm's dominant logic affects the effectiveness of dominant logic later in the organization's lifecycle. In other words, the emergence of dominant logic is decisive for how well the organization will be able to adapt to changes in the environment. Coherence among the element constituting a dominant logic constitutes a fine line: while coherence is associated with superior performance (e.g., Hamel and Prahalad 1994; Black et al. 2005), too much coherence can be associated with limiting strategic change.

Implications for Future Research

A focus on the emergence of dominant logic requires studying the relevant processes to understand the patterns through which it develops. Of particular interest is the study of entrepreneurial ventures and firms in less well-established industries (e.g., Santos and Eisenhardt 2009) and firms that are active in a transition economy (e.g., Obloj et al. 2010), because, in these situations, researchers can witness how coherence among the different dimensions of dominant logic

comes about. Social and environmental ventures can also be a very interesting field of study for dominant logic.

Other methods are used to study dominant logic. Examples for such methods are repertory grid technique (Wright 2008) and causal mapping (Jenkins and Johnson 1997; Nadkarni and Narayanan 2005, 2007). Particularly interesting could also be the use of experiments where participants perform a search on a rugged landscape model (e.g., Billinger et al. 2013) or in a business simulation game (e.g., Gary and Wood 2011; Gary et al. 2012).

On a theoretical level, we see several areas of special interest. First, political processes most definitely influence the organizational dynamics and the emergence of a dominant logic. However, extant research on dominant logic – while recognizing the political processes – has largely ignored it. Second, developing the links between dominant logic and institutional logic (Hill 2000; Thornton et al. 2012) seems very promising. Finally, we see great potential for studying the impact of dominant logic on the evolution of adaptive goals since dominant logic is formed through goal-directed processes and, in turn, affects goal adaptation.

See Also

- ▶ [Adaptive Aspirations](#)
- ▶ [Aspiration Levels and Learning](#)
- ▶ [Behavioural Strategy](#)
- ▶ [Heuristics and Biases and Strategic Decision-Making](#)
- ▶ [Organizational Change](#)
- ▶ [Strategic Decision-Making](#)
- ▶ [Strategic Learning](#)
- ▶ [Upper Echelons Theory](#)

References

- Baden-Fuller, C., and M. Morgan. 2010. Business models as models. *Long Range Planning* 43: 156–171.
- Bettis, R.A., and C.K. Prahalad. 1995. The dominant logic: Retrospective and extension. *Strategic Management Journal* 16: 5–14.

- Bettis, R.A., S.S. Wong, and D. Blettner. 2011. Dominant logic, knowledge creation, and managerial choice. In *Handbook of organizational learning and knowledge management*, ed. M. Easterby-Smith and M.A. Lyles. New York: Wiley-Blackwell.
- Billinger, S., N. Stieglitz, and T.R. Schumacher. 2013. Search on rugged landscapes: An experimental study. SSRN. Available at: <http://ssrn.com/abstract=1711743>.
- Black, J., F.H. Fabian, and K. Hinrichs. 2005. Fractals, stories and the development of coherence in strategic logic. *Competence-Based Strategic Management Applications* 7: 421–441.
- Brännback, M., and P. Wiklund. 2001. A new dominant logic and its implications for knowledge management: A study of the Finnish food industry. *Knowledge and Process Management* 8: 197–206.
- Coté, L., A. Langley, and J. Pasquero. 1999. Acquisition strategy and dominant logic in an engineering firm. *Journal of Management Studies* 36: 919–952.
- D'Aveni, R.A., D.J. Ravenscraft, and P. Anderson. 2004. From corporate strategy to business-level advantage: Relatedness as resource congruence. *Managerial and Decision Frames* 25: 365–381.
- Gary, M.S., and R.E. Wood. 2011. Mental models, decision rules, and performance heterogeneity. *Strategic Management Journal* 32: 569–594.
- Gary, M.S., R.E. Wood, and T. Pillinger. 2012. Enhancing mental models, analogical transfer, and performance in strategic decision making. *Strategic Management Journal* 33: 1129–1246.
- Ginsberg, A. 1989. Construing the business portfolio: A cognitive model of diversification. *Journal of Management Studies* 26: 417–438.
- Hamel, G., and C.K. Prahalad. 1994. *Competing for the future*. Boston: Harvard Business School Press.
- Hill, C.W.L. 2000. Dominant logic and the iron cage: Economics meets sociology in strategic management. In *Advances in strategic management*, vol. 17, ed. J. Baum and F. Dobbin. England: Emerald Group Publishing.
- Jarzabkowski, P. 2001. *Dominant logic: An aid to strategic action or a predisposition to inertia?* Working paper No. RPO 110. Birmingham: Aston Business School Research.
- Jenkins, M., and G. Johnson. 1997. Entrepreneurial intentions and outcomes: A comparative causal mapping study. *Journal of Management Studies* 34: 895–920.
- Lampel, J., and J. Shamsie. 2000. Probing the unobtrusive link: Dominant logic and the design of joint ventures at general electric. *Strategic Management Journal* 21: 593–602.
- Nadkarni, S., and V.K. Narayanan. 2005. Validity of the structural properties of text-based causal maps: An empirical assessment. *Organizational Research Methods* 8: 9–40.
- Nadkarni, S., and V.K. Narayanan. 2007. Strategic schemas, strategic flexibility, and firm performance: The moderating role of industry clockspeed. *Strategic Management Journal* 28: 243–270.
- Obloj, K., and M. Pratt. 2005. Happy kids and mature losers: Differentiating dominant logics of successful and unsuccessful firms in emerging markets. In *Strategy in transition*, ed. R. Bettis. Oxford: Blackwell.
- Obloj, T., K. Obloj, and M. Pratt. 2010. Dominant logic and entrepreneurial firms' performance in transition economy. *Entrepreneurship: Theory and Practice* 34: 151–170.
- Porac, F.J., Y. Mishina, and T.C. Pollock. 2002. Entrepreneurial narratives and the dominant logics of high-growth firms. In *Mapping strategic knowledge*, ed. A. Huff and M. Jenkins. London: Cromwell Press.
- Prahalad, C.K. 2004. The blinders of dominant logic. *Long Range Planning* 37: 171–179.
- Prahalad, C.K., and R.A. Bettis. 1986. The dominant logic: A new linkage between diversity and performance. *Strategic Management Journal* 7: 485–501.
- Ray, S., and R. Chittoor. 2005. *Re-evaluating the concept of dominant logic: An exploratory study of an Indian business group*. Calcutta: Indian Institute of Management.
- Rumelt, R. 2011. *Good strategy/bad strategy: The difference and why it matters*. New York: Random House.
- Santos, F.M., and K.M. Eisenhardt. 2009. Constructing markets and shaping boundaries: Entrepreneurial power in nascent fields. *Academy of Management Journal* 52: 643–671.
- Teecce, D.J. 2010. Business models, business strategy and innovation. *Long Range Planning* 43: 172–194.
- Thornton, P.H., W. Ocasio, and M. Lounsbury. 2012. *The institutional approach to culture, structure, and process*. Oxford: Oxford University Press.
- Von Krogh, G., and J. Roos. 1996. A tale of the unfinished. *Strategic Management Journal* 17: 729–737.
- Von Krogh, G., P. Erat, and M. Macus. 2000. Exploring the link between dominant logic and company performance. *Creativity and Innovation Management* 9: 82–93.
- Wright, R.P. 2008. Eliciting cognitions of strategizing using advanced repertory grids in a world constructed and reconstructed. *Organizational Research Methods* 11: 753–769.

Doz, Yves (Born 1947)

Gabriel Szulanski
INSEAD, Singapore, Singapore

Yves Doz is Emeritus Professor of Strategic Management and the Solvay Chaired Professor of Technological Innovation at INSEAD, Fontainebleau, France. He was born in France and educated at Harvard. His research has focused on strategic decision-making and resource commitment processes in complex organizations with

applications to multinational management, strategic partnerships/joint ventures, management of technology and innovation, corporate renewal and resource mobilization processes. Two important beliefs define his approach to research: (1) the quality of strategy-making processes is revealed most clearly when managers and organizations face conflicting demands; (2) organizational processes should be explored in situ whenever possible.

Studies and Academic Career

Born in France, Yves Doz pursued undergraduate studies at the *École des Hautes Études Commerciales* (HEC), France, from 1967 to 1970. He worked briefly at Sud Aviation (now EADS) before joining the faculty of the Business Policy Department at the Centre d'Enseignement Supérieur des Affaires, France, from 1971 to 1973. Next he enrolled at the Harvard Graduate School of Business Administration, where he graduated in 1976 with a Doctor of Business Administration in Business Policy degree. He then joined the faculty of the Harvard Graduate School of Business Administration as Assistant Professor of Business Policy.

In 1980 Doz joined INSEAD in France as associate professor. He advanced to full professor in 1986. After holding the John Loudon Chair in International Management, from 1994 he held the Timken Global Technology and Innovation Chair, and from 2011 the Solvay Chair of Technological Innovation.

Doz held multiple institutional roles, including Associate Dean for Research and Development (1990–1995) and Dean of Executive Education (1998–2002). From 2005 until early 2011, he was a part-time visiting professor at Aalto University (formerly Helsinki School of Economics), where he also acted as visiting Dean of the Center for Knowledge and Innovation Research.

Teaching

Doz has taught at the Harvard Business School, Stanford's Graduate School of Business, Seoul

National University and Aoyama Gakuin University in Tokyo. He directed and taught in executive programmes on strategic ► [alliances](#) and partnerships. He also offered doctoral seminars on strategy process and the multinational enterprise, and taught the MBA core Business Strategy course and various MBA electives. He is the author of over 40 pedagogical case studies on a variety of topics including alliance management, global integration and strategic renewal.

Honours and Awards

The Strategic Management Society appointed him as Inaugural Fellow in 2005 and gave him the 2011 CK Prahalad Distinguished Scholar-Practitioner Award. From the Academy of Management, he received the 1977 A. T. Kearney Award for Outstanding Research in the Field of General Management for his dissertation, the 2003 Distinguished Scholar Award from the International Management Division, and was later appointed as Fellow in 2006. He was appointed as Fellow of the Academy of International Business in 1996 and served as its President from 2008 to 2010. He received an honorary doctorate from Helsinki School of Economics in 2011 and was also listed as a European management guru by *The Economist*.

Writings, Interests and Business Experience

Yves Doz has authored 29 articles in refereed academic journals, 10 books, 44 book chapters and 27 managerial articles. His research has focused on strategic decision-making and resource commitment processes in complex organizations with applications to multinational management; strategic partnerships/joint ventures; management of technology and innovation; corporate renewal and resource mobilization processes.

Two important beliefs define his approach to research. The first is that the quality of strategy-making processes is revealed most clearly when

managers and organizations face conflicting demands. Thus, his research on the ► [multinational corporations](#) focuses on the conflicting need for MNCs to be globally efficient and locally responsive to the idiosyncratic demands imposed by different host countries. Likewise, his work on alliances focuses on the tension that arises from the conflicting needs to achieve collaboration within an alliance while possibly competing with the same partner(s) outside the alliance.

The second belief is that organizational processes should be explored in situ whenever possible. In his own words: ‘Let’s go there, see, learn, and figure out.’ Formative field investigations include interviewing senior management at Philips in the Netherlands jointly with C. K. Prahalad in an attempt to understand why the company could not solve its reorganization problems, and his exposure to the reorganization efforts of Rank Xerox (now Xerox Europe).

Professor Doz currently carries out research on how companies can achieve strategic agility, focusing on the dual imperative to exploit existing resources while pursuing exploration, innovation and self-renewal.

See Also

- [Alliances](#)
- [Multinational Corporations](#)

Selected Works

- 1987 (with C. K. Prahalad). *The multinational mission: Balancing local demands and global vision*. New York: Free Press.
- 1998 (with G. Hamel). *Alliance advantage: The art of creating value through partnering*. Boston, MA: Harvard Business School Press.
- 2001 (with J. Santos and P. Williamson). *From global to metanational: How companies win in the knowledge economy*. Boston, MA: Harvard Business School Press.
- 2008 (with M. Kosonen). *Fast strategy: How strategic agility will help you stay ahead of the game*. Upper Saddle River, NJ: Wharton School Press.
- 2012 (with K. Wilson). *Managing global innovations*. Boston, MA: Harvard Business School Press.

Drucker, Peter: The Drucker Strategic Management System

Joseph A. Maciariello
Claremont Graduate University, Claremont,
CA, USA

Abstract

Drucker’s master project as a social ecologist was to describe and illustrate how to *manage discontinuities through processes of continuity and change*. As he applied his methodology to the enterprise, his emphasis was on providing customer value and adapting to change through innovation. He established the management philosophy of management by objectives (MBO) to implement strategy, and called MBO the *fundamental strategy of the business*. Drucker’s work on strategy benefits by being organized as a configuration of interrelated parts. This article identifies and describes this configuration. The configuration is titled the ‘Drucker strategic management system’ (DSMS). The DSMS consists of humanly determined values focused on the welfare of individuals, organizations and society. The DSMS has been used by many executives but also has its critics.

Definition In 1964, Peter F. Drucker wrote *Managing for Results*, one of the first books on strategy management. His work on strategy management continued to evolve into what he called ‘the theory of the business’ (Drucker 1994). It became a centerpiece of his work on management in both the business and nonprofit sectors. The theory of the business guides both strategy formulation and implementation in Drucker’s books and articles. It in turn is derived from his overall methodology of social ecology.

Introduction

Peter Drucker considered himself a social ecologist. Like other notable social ecologists, including

Alexis de Tocqueville, author of *Democracy in America*, and Walter Bagehot, editor and chief of *The Economist* from 1861 to 1877, he devoted his writings to analysing the relationships between people and their social, economic and political institutions. In one book after another Drucker concerned himself with emerging social trends. His objective was to provide leaders of society's institutions with knowledge of 'the future that has already happened' to help them develop policies, practices and competencies to shape their future and to manage discontinuities. Drucker's work, like that of de Tocqueville and Bagehot, aimed at impact and action. This led Drucker to his understanding of the purpose of a business and of the role of strategy and ► [strategic planning](#) in the business enterprise:

There is only one valid definition of business purpose: to create a customer . . . [And, b]ecause the purpose of business is to create a customer, the business enterprise has two – and only two basic functions: marketing and innovation. Marketing and innovation produce results; all the rest are costs. (Drucker and Maciariello 2008: 98)

It [strategic planning] is the continuous process of making present risk-taking decisions systematically with the greatest knowledge of their futurity; organizing systematically the efforts needed to carry out these decisions; and measuring the results of these decisions against the expectations through organized, systematic feedback. (Drucker and Maciariello 2008: 125)

Drucker believed that his *Managing for Results* (1964) was the first book written on business strategy (Drucker 1986: vii). In the Preface to the 1986 re-issue, he states: '*Managing for Results* . . . begins with an analysis of what the book calls "business realities" – the fundamentals and constants of the outside environment, the things the business executive has to consider as "givens", as constraints, as challenges. And it proceeds to discuss how a business positions itself in respect to these "realities" to convert them into opportunities for performance and results' (Drucker 1986: vii).

Drucker's entire methodology of social ecology is a procedure for strategic planning and decision-making for the institutions of society. He describes his methodology in 'Reflections of a social ecologist' (Drucker 1992). In this article

he asks and then answers five questions (p. 62): What changes have already happened that do not fit 'what everybody knows'? What are the paradigm changes? Is there any evidence that this is a change and not a fad? Are there results of this change? (Does it make a difference, in other words?) If a change is relevant and meaningful, what opportunities does it offer? His work at the enterprise level is an application of this methodology focused primarily on the importance of two functions – *marketing* and *innovation* – and a philosophy of management – *management by objectives*.

The Drucker Strategic Management System (DSMS): Configuration of Interconnected Parts

Elements of the DSMS and interactions among them are illustrated in Figs. 1 and 2. The purpose of the system is to develop, validate and implement an organization's strategy, which for Drucker is a set of assumptions contained in the 'theory of the business' (THOB or business model).

'These assumptions are about markets. They are about identifying customers and competitors, their values and behaviors. They are about technology and its dynamics, about a company's strengths and weaknesses. These assumptions are about what a company gets paid for' (Drucker 1994: 96).

Implementing and Validating the Theory of the Business

Figure 1 integrates Drucker's work on environment, core competencies, mission (i.e., the theory of the business), with strategies, management by objectives (MBO), organization structure, work assignments, expected results and innovation into a systematic framework for developing and validating the *specific theory of the business* for each business within an enterprise. A description of the THOB starts with the mission of an organization and the two elements that are essential to its formulation – the organization's *environment* and its *core competencies*.

Mission

The mission sets the direction for a business enterprise or nonprofit organization. It requires an analysis of the environment and an assessment of the core competencies required to be successful. It is used by the organization to communicate where the business is going, along with the rationale as to why it is going in a given direction. Finally, it helps executives align the activities of its people. From the mission, each person should understand and gain direction for his or her role in the organization.

Environment

Formulating a mission should force executives to evaluate current trends in the environment, emerging changes, and problems that may be turned into profitable realities. The relevant environments include where an enterprise is currently operating, and where non-customers are being served as well as where future customers are likely to be served.

Core Competencies

Executives must understand the core competencies of their organization when formulating their mission. They must ask what the organization is really good at. Core competencies may be capabilities inferred by examining successes and failures, especially unexpected outcomes.

Armed with an analysis of environmental realities and a determination of core competencies an organization is in a position to formulate its mission. The mission should provide answers to key Drucker questions:

- What is our business?
- Who is our customer?
- What does the customer consider of value?
- What are results and how should they be measured?

The mission statement also should be used to ponder the entrepreneurial and core competency questions:

- What should our business be? and
- What new competencies are required?

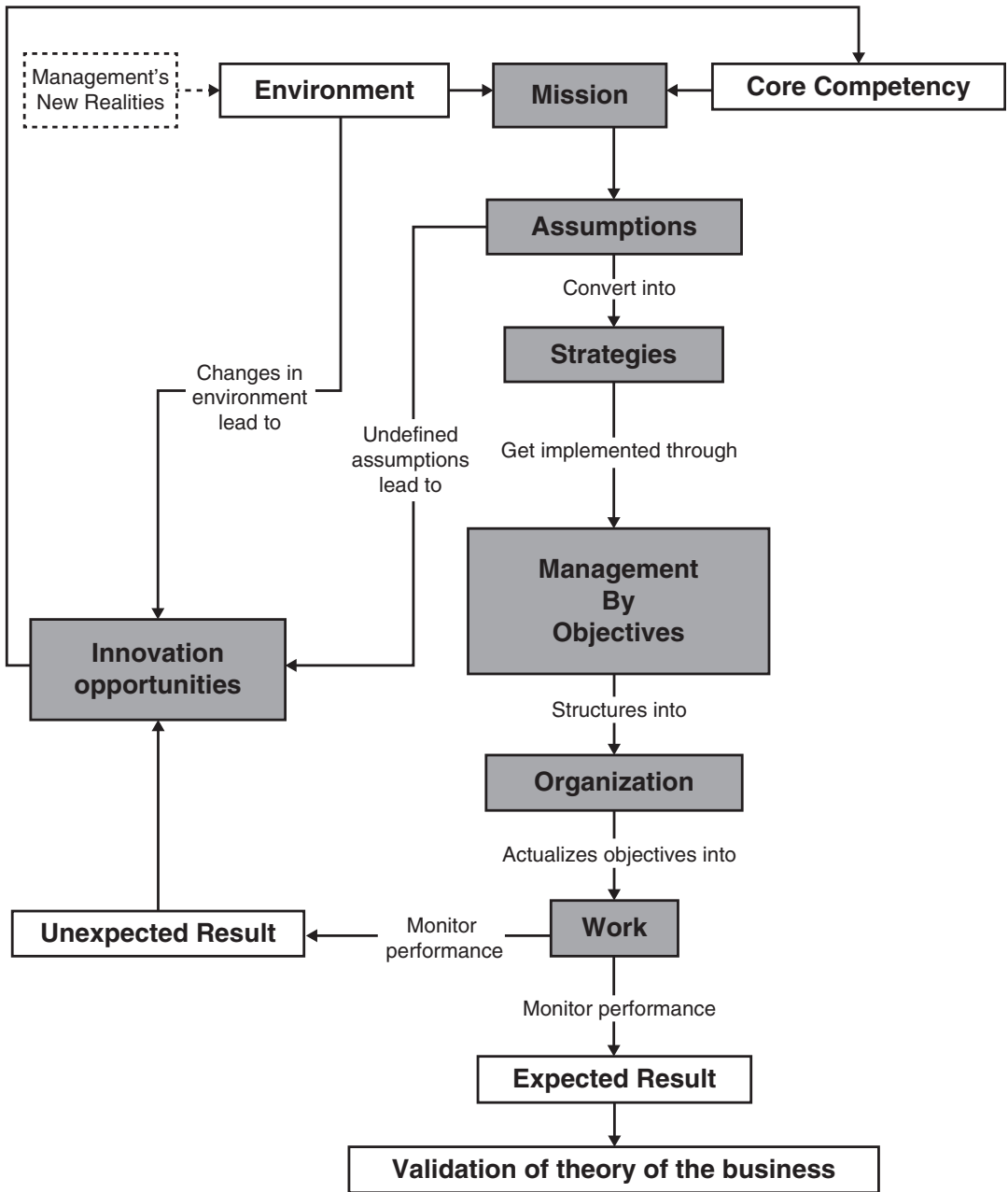
All theories of the business eventually become obsolete. The time to ask the last questions – what *should* our business be and what new competencies are required? – is when the existing theory is still valid yet becoming vulnerable to competitive or to technological change. To develop a new theory of the business an organization must have competency in innovation.

Innovation

Innovation ‘is the act that endows resources with a new capacity to create wealth’ (Drucker 1985: 85). It is prominently represented in Fig. 1.

Drucker believes that executives have a social responsibility to develop a core competence in innovation if they lack it (Maciariello 2015). The argument for it follows directly from ► Schumpeter, Joseph (1883–1959)’s analysis of the processes of disequilibrium which characterize capitalistic societies: ‘rapid destruction of the existing businesses – especially the big ones – by innovation, the “creative destruction” by the innovator, in Joseph Schumpeter’s famous phrase, poses a genuine social threat to employment, to financial stability, to social order, and to governmental responsibility’ (Drucker 1985: 144; Schumpeter 1942: 81–110). Drucker thus connects his work on innovation directly to his master project of managing discontinuities (such as those caused by creative destruction) in society by attempting to maintain a continuity of values in society and organizations while aggressively pursuing innovation and change (Drucker 2003: xv–xxiii).

Changes, including unexpected results and ongoing processes of creative destruction, create a need for systematic innovation of products, processes and management practices (Schumpeter 1942). And a process of systematic abandonment of products, processes and services that are no longer productive must be practised in order to create resources necessary to fund innovative projects. To abandon takes courage, powerful forces are often aligned against it, but ‘[o]ne has got to face up to a very simple, very brutal, very harsh rule – one starves problems and feeds opportunities. And above all, one puts resources into tomorrow [the likely growth areas], where the results



Drucker, Peter: The Drucker Strategic Management System, Fig. 1 Marketing and innovation in the Drucker strategic management system

are, and not into yesterday [products that are either mature or in the declining part of their life cycle], where the memories are' (Drucker and Maciariello 2008: 285). Some, perhaps most, innovations will fail; this is the nature of

innovation and business risk. The question in evaluating an overall innovation program is: Do the benefits of innovations that succeed significantly exceed the losses of those that fail? (Maciariello 2015).

MBO: The Fundamental Strategy of a Business

Strategic decisions and allocation of people and capital flow from attempts to implement an organization's mission. Strategies must then be broken down into specific strategic objectives and implemented through the use of MBO. 'Objectives, in other words, represent the fundamental strategy of a business' (Drucker 2001: 201). MBO is a well-defined methodology for aligning each of the units and each of the individuals within a unit of an organization with the organization's theory (or commercial logic) of the business.

MBO requires setting ► [strategic objectives](#) in eight key areas of the enterprise. Objectives are set to balance the need to meet performance expectations in the present while capitalizing on opportunities that will benefit future performance. Objectives become the basis for making work assignments. If properly set and implemented, MBO assists executives in *implementing* and then *validating* the enterprise's theory of the business and in optimizing the long-term wealth creating capacity of the enterprise.

First comes the development of *marketing* and *innovation* objectives. Marketing objectives emphasize how the organization can better serve current markets, and innovation objectives emphasize how the organization can create new markets.

Attracting human resources, especially scarce talent, is also a marketing task. So is partnering that goes on in forming and maintaining alliances. These strategic objectives require answers to two additional marketing questions: how should our organization position itself to be attractive to the specific human resources we require to fulfil our mission? And what must we do to gain the cooperation and commitment from alliance partners?

After formulating marketing and innovation objectives, work turns to setting the remaining strategic objectives, *human*, *financial* and *physical* resource objectives. Then *productivity* objectives must be established for human, capital and physical resources. For knowledge workers productivity should be measured in terms of 'the quality of the quantity' of output. Once these objectives have been set, objectives should be established for *social responsibility* and for *profit*.

The question that must be answered to set profitability objectives is: what is the minimum amount of profit required to compensate for our cost of capital, including risk-premium, and for the cost of providing for future innovation and the development of human assets?

Work Assignments

All strategic plans and strategies must 'degenerate into work' (Drucker 1973/1974: 128). Executives design organization structures to convert objectives into work assignments. Reporting relationships and responsibilities for assignments are established and deadlines are set.

Expected Results

Effective executives monitor work assignments and seek feedback by measuring actual results and comparing them with expected results. If actual results are aligned with expected results, the theory of the business is validated.

We turn now to those aspects of executive leadership and management that are essential to formulating and implementing strategy. These are captured in Fig. 2.

Executive Practices, Skills and Tasks Required in the Drucker Strategic Management System

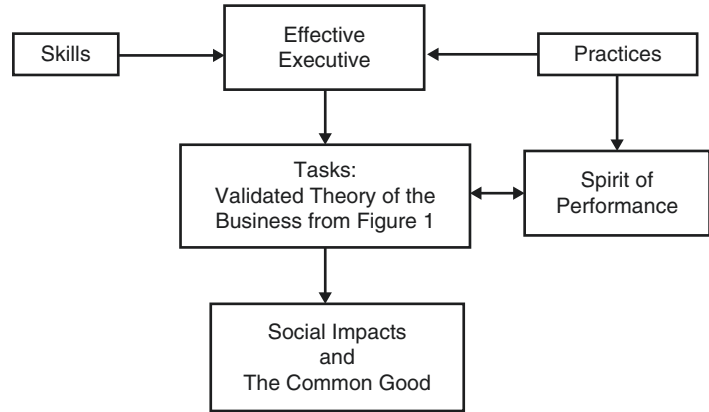
Executive Practices

Five individual practices for *getting the right things done* are described in *The Effective Executive* (Drucker 1967) and in the companion book *The Effective Executive in Action* (Drucker and Maciariello 2006). These five practices are time management focus upon contribution, staff from strength, focus on the future and effective decision-making. Our interest here is in those practices that have significant impact on the formulation and implementation of strategy.

Focus on the Future

Or 'first things first' (Drucker 1966: 100–112), requires that we change our mindset from one that is focused primarily on 'crises' to be solved to opportunities to be pursued. Crises must be

Drucker, Peter: The Drucker Strategic Management System, Fig. 2 Integration of executive leadership and effectiveness into Drucker strategic management (Reproduced by permission from Maciariello, J. A. 2009. Marketing and innovation in the Drucker management system. Journal of the Academy of Marketing Science 37, 36)



solved but there is a difference between a mindset that is primarily searching for opportunities, and a mindset that is primarily focused on problem solving and ‘fire-fighting’.

Superior performance is achieved by focusing on areas of opportunity and abandoning all unproductive activities. We should ask ourselves the well-known Drucker questions: ‘If we were not already undertaking a particular activity, product or process would we start doing it now? And if we would not, then we should ask what should we do about it?’ (Drucker and Maciariello 2004: 8; Drucker 1999: 205). Jack Welch, long-time CEO at General Electric, has described the influence of this question on his early strategic decisions as CEO (Welch 2007). The rule is to *feed opportunities and starve problems*.

Executive Skills

Executives must acquire skills in five areas in order to be effective: decision-making, communications, budgeting, measurement and control and the management sciences. Skills of budgeting and measurement are especially important in the DSMS.

Budgeting

Operating and capital budgets are established to maintain current operations. For these budgets, the appropriate question is: what is the minimum amount of resources necessary to keep existing operations going? Administered budgets, on the other hand, are discretionary, *opportunity-focused* budgets, used for new products, new programmes and research. Here executives must ask: what is

the largest sum these activities can use effectively to accomplish future objectives? Activities in opportunity budgets should be budgeted over the life cycle of the opportunity in order to guarantee proper funding.

The budget process also provides a forum for periodically evaluating existing markets, products, processes, and programmes. It can be used to help institutionalize an organization-wide process of *systematic abandonment*. Activities that we would no longer continue if we were not already doing them should be evaluated for abandonment.

Measurement

An organization’s choice of controls indicates to people what is valued, what is desired and subsequently what people pay attention to. Controls are therefore not neutral. For example, if the ‘customer is the business’ (Drucker 1964: 90–110), controls should be in place to measure market share, customer satisfaction, customer retention and the cost of acquiring new customers as well as a whole host of other variables congruent with marketing objectives.

Innovative activities should be assessed at variable time intervals consistent with the time and effort it takes to demonstrate progress. These time intervals differ from one innovative project to another. One must avoid the practice of measuring innovative activities too frequently, to see how they are progressing and, in the process, stunt progress, a practice Drucker calls ‘pulling up the radishes’ (Drucker and Maciariello 2008: 327).

Measurements include systems for product costing. Many organizations follow bottom-up costing of products and services, in which desired profit is added to direct labour, direct materials and overheads to arrive at prices almost regardless of prices consumers are willing to pay for the value provided. This pricing practice is also called cost-led pricing.

Target costing and pricing (or price-led costing), on the other hand, reverses the process and begins with customer values and target prices necessary to attract demand. The cost system is then used to help design products and services that provide customer value within cost targets and allow appropriate margins to be realized. Target costing is a strategic *costing system*.

An example from the literature illustrates the difference a costing system can make in providing value to customers:

Mercedes practiced what Peter Drucker calls ‘cost-based pricing’: take whatever it takes to produce a product, add a handsome profit margin, and – voilà – you have the selling price. But Toyota’s Lexus changed the rules of the game in 1986 with what Drucker terms ‘price-based costing’. Customer research identified a burgeoning demand for Mercedes style luxury at a price point below \$40,000, so the need to price the Lexus 400LS sedan at \$38,000 drove product development. The resulting combination of luxury and value sent shock waves through the market, as it became savvy to buy a Lexus instead of a more expensive, over engineered Mercedes. (Cristol and Sealey 2000: 46)

In addition to ‘hard’ marketing and innovation measurements, such as target costs and the percentage of revenue coming from new product innovations, executives require qualitative assessments. These are often more important indicators of future performance than are quantitative measurements. Assessments that provide information on the status of the pipeline for new product introductions, along with a comparison with estimated status of the pipeline of competitors, may be far more important assessments than many quantitative measurements.

Scorecard for Managers

Just as Drucker led or foreshadowed developments in many areas of marketing and innovation,

so he anticipated measuring *managerial performance* versus *business performance*. Drucker describes the need for ‘a scorecard for managers’ which contains periodic audits of a business in areas critical to its survival (Drucker 1980: 67–71). Preparation of this scorecard rises to the level of a ‘conscience activity’ for top management (i.e., measuring variables that are very critical to the health of the firm). The scorecard includes managerial measurements of performance in allocation of capital; people decisions; innovation decisions; and overall strategic decisions.

Executive Tasks

There are five executive tasks: setting objectives, organizing, motivating and communicating, establishing yardsticks of performance, and developing oneself and others. Each of these tasks is carried out through MBO (see ‘Key Features of MBO’ and ‘The Management Letter’ in Maciariello 2013).

Spirit of Performance

Executive leadership is concerned with creating organizations that have a high spirit of performance. This can only be done in what Drucker calls the ‘moral realm’. Why? Because it requires an organization to overcome the natural entropic tendencies that set into *human organizations* and lead to bureaucratic tendencies in which rules become more important than creativity, innovation and results. In contrast, an organization of high spirit is one that is led by executives who are committed to *getting the right things done* and to *doing the right thing*. These executives possess integrity of character, have a vision for the purpose of their organization, focus on opportunities, are change leaders, and perform essential practices, skills and tasks. They establish strict principles of conduct and responsibility for themselves and for others. As they do they fulfil the purpose of organization, which to Drucker is to:

‘[M]ake common men do uncommon things’ . . . it is the test of an organization that it make ordinary human beings perform better than they are capable of, that it bring out whatever strength there is in its members and use it to make all other members

perform better and better. It is the test of an organization that it neutralize the weaknesses of its members. (Drucker 1954: 144–145)

Social Impacts and Common Good

Organizations are public institutions, and their actions have impacts on society. Executive codes of professional ethics must prohibit executives from knowingly doing harm. Legal and ethical violations should be met with stiff penalties for those who break the law and who otherwise knowingly do harm.

Negative Social Impacts

Each institution must be dedicated to its mission, *its first social responsibility*. Detrimental impacts to society created in pursuit of mission must be minimized because they are harmful to the common good and are outside the proper scope of the mission of an organization.

Social Problems May Be Converted into Business Opportunities

The second type of social impact, social ills or dysfunctions, should be thought of as challenges and treated as potential business opportunities. Organizations should aggressively pursue activities that turn the elimination of social dysfunctions into business opportunities. For example, Branch Rickey, president and general manager of the Brooklyn Dodgers, broke the colour line in professional baseball by bringing Jackie Robinson into Major League baseball and by encouraging him not to give up as he suffered abuses because of prejudice and hardship amassed against him by other players, coaches, reporters and fans.

To summarize our discussion of Fig. 2, ‘executive skills’, ‘executive tasks’ and ‘executive practices’ must be combined into principles of effectiveness in order to formulate and implement an enterprise’s theory of the business. Executive effectiveness includes formulating the mission (the ‘theory of the business’ or business model) and implementing the mission through MBO. It focuses organizational resources on marketing opportunities and on systematic innovation and entrepreneurship. Innovation is focused primarily outwardly, on opportunities, on the customer, on

technology, on competitors, and so on. Even re-engineering internal processes should start by asking how internal processes should be designed to better serve the customer.

Criticism

This management system is not without critics. *The New York Times*, in an article that appeared two days before Peter Drucker’s 90th birthday, suggested that ‘[c]orporate America and Dr. Peter Ferdinand Drucker have fallen out of favor with each other’ (Andrews 1999). The article goes on to state ‘[t]he religion of shareholder supremacy has him shaking his head’. The article centres on six major points:

1. ‘Dr. Drucker still has his disciples, but at the bleeding edge of business the old master’s life-work is commonly seen as simplistic, portentous, off the mark, idealistic, out of date.’
2. [Drucker] ‘disdains a corporate order that is in thrall to stock prices and that rewards its chief executives as though they were power forwards . . .’
3. ‘Dr. Drucker said in an interview last week, “The most critical management job is to balance short term and long term. In the long term, today’s one sided emphasis is deleterious and dangerous.”’
4. ‘To his thinking, two personages, the customer and the highly skilled employee are at least as precious as the investor . . . Learning to balance these divergent but ultimately shared interests is “the challenge . . .” he said.’
5. [Drucker’s premise that] ““There is only one valid definition of business purpose: to create a customer.” Does that premise still pertain?”
6. ‘Typically, Dr. Drucker gave the global bankers the back of his hand: “They have introduced not a single major innovation in 30 years”, he said. “Rather the financial industry has turned inward to perfecting ‘supposedly scientific derivatives’, on a shortsighted hope of wringing the risk out of financial speculation, like Las Vegas gamblers who futilely try to devise systems to beat the house.”’

A review of the main points made in the Andrews article, now more than 15 years old, in light of events associated with the 2008 financial crisis and aftermath, reveals just how wrong-headed those heavy-hitting executives were about Drucker's ideas and how timeless his philosophies are. We have delineated these philosophies in depth in our book *Drucker's Lost Art of Management* (Maciariello and Linkletter 2011) and believe they remain valid because they are based upon enduring moral values supporting Drucker's life's work.

Conclusion

The Drucker strategic management system is a philosophy of management whose purpose is to achieve certain humanly determined moral values – for individuals, for organizations and for society. Using it, we always ask how what is right for society and individuals can be made right for organizations.

The DSMS is a moral system because Drucker's work is grounded in morality. He ends his article on his methodology (Drucker 1992: 64) by stating, '[f]inally, social ecology is not value free. If it is a science at all, it is a "moral science" – to use an old term that has been out of fashion for 200 years. The physical ecologist believes, must believe, in the sanctity of natural creation. The social ecologist believes, must believe, in the sanctity of spiritual creation. Today, there is a great deal of talk about "empowering" people. This is a term I have never used and never will use. Fundamental to the discipline of social ecology is not a belief in power, but the belief in responsibility, in authority grounded in competence and compassion.'

Drucker has provided us with a very powerful strategic management system for satisfying the needs of individuals and society. I know of no other system that is so well conceived and developed for carrying out these tasks.

See Also

- ▶ [Balanced Scorecard](#)
- ▶ [Management by Objectives and Self-Control](#)

- ▶ [Schumpeter, Joseph \(1883–1950\)](#)
- ▶ [Social Entrepreneurship](#)
- ▶ [Strategic Objectives](#)
- ▶ [Strategic Planning](#)

References

- Andrews, F. 1999. Management: Ideas into action. The sage of value and service. *New York Times*, 19 November. Available at: <http://www.nytimes.com/1999/11/17/business/management-ideas-into-action-the-sage-of-value-and-service.html>. Accessed 19 Aug 2015.
- Cristol, S.M., and Sealy. 2000. *Simplicity marketing: End brand complexity, clutter and confusion*. New York: The Free Press.
- Maciariello, J.A. 2009. Marketing and innovation in the Drucker management system. *Journal of the Academy of Marketing Science* 37: 35–43.
- Maciariello, J.A. 2015. Foreword. In *Innovation and entrepreneurship: Practice and principles*, ed. P.F. Drucker. London: Taylor & Francis.
- Maciariello, J.A., and K.E. Linkletter. 2011. *Drucker's lost art of management*. New York: McGraw-Hill.
- Schumpeter, J.A. 1942. *Capitalism, socialism and democracy*. New York: Harper & Row.
- Welch, J. 2007. *Interview with Jack Welch*. Claremont: Claremont Colleges Digital Library. Available at: <http://ccdlib.libraries.claremont.edu/cdm/ref/collection/dac/id/2207>. Accessed 20 Aug 2015.

Selected Works

- Drucker, P.F. 1954. *The practice of management*. New York: Harper & Row.
- Drucker, P.F. 1966. *The effective executive*. New York: Harper & Row.
- Drucker, P.F. 1964. *Managing for results*. New York: Harper & Row.
- Drucker, P.F. 1973/1974. *Management: Tasks, responsibilities, practices*. New York: Harper & Row Publishers.
- Drucker, P.F. 1980. *Managing in turbulent times*. New York: Harper & Row.
- Drucker, P.F. 1985. *Innovation and entrepreneurship*. New York: Harper & Row.
- Drucker, P.F. 1986. *Managing for results*. New York: Harper & Row.
- Drucker, P.F. 1992. Reflections of a social ecologist. *Society* 29: 57–64.
- Drucker, P.F. 1994. The theory of the business. *Harvard Business Review*, Sept–Oct, 95–104.
- Drucker, P.F. 1999. *Management challenges for the 21st century*. New York: HarperCollins.
- Drucker, P.F. 2001. *The essential Drucker*. New York: HarperCollins.
- Drucker, P.F. 2003. *A functioning society: Selections from sixty-five years of writing on community, society, and polity*. New Brunswick: Transaction Publishers.

- Drucker, P.F., and J.A. Maciariello. 2004. *The daily Drucker*. New York: HarperCollins.
- Drucker, P.F., and J.A. Maciariello. 2006. *The effective executive in action*. New York: HarperCollins.
- Drucker, P.F., and J.A. Maciariello. 2008. *Management: Revised edition*. New York: HarperCollins.

Dunning, John H. (1927–2009)

Sarianna M. Lundan
University of Bremen, Faculty of Business
Studies and Economics, Bremen, Germany

Abstract

The seminal contribution made by John Dunning to the field of strategic management is the development of the eclectic or ownership location internalization (OLI) paradigm, which explains why a firm would choose to exploit its ownership specific advantages in another country by internalizing their use inside the firm, rather than by means of licensing or contractual partnerships.

John Dunning had a career that spanned six decades and resulted in the publication of more than 50 books and countless journal articles on foreign investment and the activities of multinational enterprises (MNEs) in 60 different outlets. Among other accolades, this work earned him six honorary doctorates and an OBE from Queen Elizabeth II. The most cited of all Dunning's publications by far is his magnum opus *Multinational Enterprises and the Global Economy*, the second edition of which we worked on together (Dunning and Lundan 2008a). Other widely acclaimed and highly cited contributions include his two-decade award-winning articles in the *Journal of International Business Studies (JIBS)*, the first presenting an extension of the eclectic paradigm (Dunning 1988) and the second emphasizing the importance of location in understanding MNE activity (Dunning 1998). His published autobiography (Dunning 2008) and the last volume of collected essays (Dunning 2010) offer

insight into his career path and the evolution of his recent thinking.

The breadth of Dunning's work covers the history and patterns of ► **foreign direct investment (FDI)** across countries, and over time, the theory of the MNE, the impact of MNEs on home and host countries, as well as the political and social dimension of MNE activities. While many of these topics will be of relevance to those scholars in strategic management who work on international business issues, probably the most relevant part of Dunning's voluminous output in relation to strategic management is the eclectic or ownership location internalization (OLI) paradigm.

The eclectic theory (as it was first called) was introduced in 1977, and subsequently amended on several occasions to account for new developments in the global economy and in the activities of MNEs. The OLI paradigm is not a theory in the strict sense, but rather a synthesizing framework that brings together different strands of literature to answer three basic questions. First, what enables foreign firms to overcome the 'liability of foreignness' and to out-compete domestic firms in the host country? Second, why do firms in general, and multinational firms in particular, choose specific locations for their activities? Third, why would a firm choose to engage in equity investment across borders rather than to exploit its ownership advantages through licensing, exports or some cooperative entry mode like joint ventures or contractual alliances?

These questions correspond to the three elements that comprise the OLI paradigm, namely ownership advantages (O), locational advantages (L) and internalization advantages (I). Although initially the OLI paradigm was mainly directed to explaining the aggregate pattern and distribution of FDI across countries, over time it began to be increasingly applied at the level of the firm, to explain why a particular firm would choose a particular modality to enter a specific market.

In terms of its theoretical background, the understanding of ownership specific advantages was mainly based on industrial organization economics, with a particular emphasis on intangible

asset advantages. Later on, this came to be followed by the resource-based theory of the firm, and specifically the work of Edith Penrose. In response to calls for a more dynamic learning model of the MNE (e.g., Pitelis 2007), the concept of dynamic capabilities was employed to explain the upgrading of ownership-specific advantages (Dunning and Lundan 2010). The basic strategy question of why and how one firm is able to outcompete another was restated in the context of cross-border expansion into the question of what enables foreign firms to outcompete domestic firms in the host country, as well as a related question, which is what allows firms of one nationality to outcompete those of another nationality in different host countries. Drawing on the work of some early scholars such as Stephen Hymer, Dunning was also quite conscious of the coexistence of explanations of ownership advantage that relied on market power on one hand, and the internalization of the development and exploitation of firm-specific knowledge on the other (Dunning and Pitelis 2008).

The locational component, not surprisingly, relied on the scholarship in economic geography and regional economics. In his last decade-winning article, Dunning was bemoaning the fact that questions related to the development of ownership advantages and the mode of entry had acquired considerably more prominence, while issues of geography, including clustering and agglomeration, were given much less attention in the literature. In his later writing, Dunning also became increasingly interested in institutional analysis (both in economics and in organization theory), and consequently the importance of overall institutional quality and the supporting institutions of markets gained focus as important locational factors (Dunning and Lundan 2008b).

The theory behind the internalization component was naturally the theory of internalization by Buckley and Casson (1976) and others, derived from the seminal work of Coase (1937). It refers to the conditions under which firms would commit resources to cross-border equity investment instead of relying on less burdensome means such as licensing and exports. In the early

versions of the eclectic theory, when the aim was to explain aggregate patterns of FDI, internalization was seen as more or less a binary choice. However, as more attention began to be paid to some of the cooperative modes of entry involving partial equity, such as joint ventures, or purely contractual relationships, the question of internalization became a question of degree rather than of kind. While most of the discussion concerning the choice between different modalities explored the conditions under which hierarchical control over transactions involving proprietary knowledge-based assets would be preferable to using a market-based mechanism, with the growing use of outsourcing agreements, more attention began also to be paid to the financial commitments and the risks related to assets ownership in relation to the flexibility achieved by contractual modalities.

The enduring strengths of the OLI paradigm are its apparent simplicity, its robustness in the face of changing circumstances, and the ability to simultaneously consider the impact of three inter-related groups of explanatory variables. Throughout his career, Dunning was continuously engaged with issues of policy, and the OLI paradigm provides a means to examine multiple variables simultaneously to provide a more holistic understanding of the impact and influence of MNEs. For such pragmatic aims, partial analyses of the kind where changes in variable X (e.g., corporate governance system or degree of diversification) are expected to have the effect Y (some measure of performance) on the focal firm, are simply not likely to provide relevant answers.

While eclecticism was the hallmark of Dunning's scholarship, it is also the biggest source of criticism of the OLI paradigm and the analyses derived from it. Since the theories that made up the three OLI components were not original to Dunning, he felt little concern about changing and amending the components as needed, in order for the paradigm to accommodate new types of MNE activity or other changes in the global economy. This was the case, for instance, with the rise of alliance capitalism, which led Dunning to put much more emphasis on strategic

alliances and cooperative modes of entry, and most recently it was the case with institutions that influenced his thinking about the sources of ownership advantages and the locational advantages or disadvantages of different host countries or regions.

These amendments and additions were sometimes greeted with suspicion by colleagues who thought that, as a result of such tinkering, the paradigm had become unwieldy (e.g., Narula 2010). Such critics may well have a point, but having contributed to some of those amendments myself, I am the wrong person to judge the final merits of such objections. I do suspect, that for those whose model of the social sciences is close to that of the natural sciences, this kind of eclecticism is likely to prove fundamentally unsatisfactory. However, those scholars who are interested in questions that in one way or another concern not just the operations of MNEs as such, but also their impact on the home and host countries, are likely to find the OLI paradigm a useful starting point for their investigations.

See Also

- ▶ [Foreign Direct Investment \(FDI\)](#)
- ▶ [Market Failures and MNEs](#)
- ▶ [Public Policy: Strategy in the Public Interest](#)

References

- Buckley, P.J., and M.C. Casson. 1976. *The future of the multinational enterprise*. London: Macmillan.
- Coase, R.H. 1937. The nature of the firm. *Economica* 1: 386–405.
- Narula, R. 2010. Keeping the eclectic paradigm simple. *Multinational Business Review* 18: 35–49.
- Pitelis, C. 2007. Edith Penrose and a learning-based perspective on the MNE and OLI. *Management International Review* 47: 207–219.

Selected Works

- Dunning, J.H. 1988. The eclectic paradigm of international production: A restatement and some possible extensions. *Journal of International Business Studies* 19: 1–31.
- Dunning, J.H. 1998. Location and the multinational enterprise: A neglected factor? *Journal of International Business Studies* 29: 45–66.

- Dunning, J.H. 2008. *Seasons of a scholar: Some personal reflections of an international business economist*. Cheltenham: Edward Elgar.
- Dunning, J.H. 2010. *New challenges for international business research: Back to the future*. Cheltenham: Edward Elgar.
- Dunning, J.H., and S.M. Lundan. 2008a. *Multinational enterprises and the global economy*. 2nd ed. Cheltenham: Edward Elgar.
- Dunning, J.H., and S.M. Lundan. 2008b. Institutions and the OLI paradigm of the multinational enterprise. *Asia Pacific Journal of Management* 25:573–593.
- Dunning, J.H., and S.M. Lundan. 2010. The institutional origins of dynamic capabilities in multinational enterprises. *Industrial and Corporate Change* 19:1225–1246.
- Dunning, J.H., and C. Pitelis. 2008. Stephen Hymer's contribution to international business scholarship: an assessment and extension. *Journal of International Business Studies* 39:167–176.

Duopoly

John Horn

University of Michigan, Ann Arbor, MI, USA

Abstract

Duopolies, or two major competitors in an industry, are the best place to start when thinking about how market concentration affects economic outcomes. Cournot (quantity-based competition) and Bertrand (price-based competition) are the two primary models used to analyse duopolies, and both provide useful insights into how these firms react strategically to each other. However, a good strategist needs to realize when the lessons from the theory should be modified, and also when the market structure contains more than one other relevant firm.

Definition A duopoly occurs when there are only two competitors in a class of products or services in a market. It is a special type of oligopoly and the basis for most of the economics of oligopolies.

A duopoly occurs when there are only two competitors in a class of products or services in a geographical market that is either regional or

global (though a true duopoly is more likely to exist the smaller the geographic expanse of the market). A duopoly is a special type of oligopoly and it is important to understand since it is the basis for most of the economics of oligopolies.

Duopoly (and oligopoly) market outcomes lie between the extremes of perfectly competitive and monopolist markets. There are two primary economic models of duopolies: Bertrand and Cournot. The Bertrand model assumes the two producers (say, A and B) compete on price. Suppose they each want to sell half the monopolistic output at the monopolistic price, but that they each have the capacity to produce much more. Producer A would have an incentive to lower its price and capture part of B's sales. In response, B would want to lower its price below A's new price. A and B would want to lower prices until they were equal to marginal cost. Bertrand duopoly competition results in the same market outcome as the perfectly competitive case.

One potential real-world problem with the Bertrand model is the assumption of unlimited capacity. The Cournot model imposes a capacity constraint on the two producers. They each have to choose the amount of capacity to sell into the market. In this model, the market price is greater, and volume less, than in the Bertrand case, although not at the monopolistic levels. The duopolists each earn a positive economic profit, although their combined profits are not as much as a monopolist would earn.

Two other issues arise with the Bertrand model when applied to the real world. The first is that the two producers do not compete with each other week after week, but set prices only once. In a repeated price-setting duopoly, producers should be able to maintain prices higher than the competitive level to avoid the price war that leads to perfectly competitive levels. The second is that each producer sells exactly the same product or service. In reality, each producer sells a slightly different product, which allows some pricing power above the perfectly competitive level. (Both these real-world conditions can also affect the Cournot outcomes.)

In the real world, there are rarely true duopolies. Boeing and Airbus compete with Bombardier

and Embraer in the aircraft market; Coke and Pepsi compete with RC Cola, private label colas, and many local bottlers around the globe; Intel and AMD are also competing against mobile chip manufacturers such as Apple and Qualcomm; and Apple and Google compete against Windows and BlackBerry for mobile device sales. These producers compete repeatedly over time, and each has some product differentiation.

For the strategist, the primary question is whether it is in fact appropriate to consider their company as part of a duopoly in which they only have to consider one other competitor. Boeing and Airbus can think of themselves as duopolists in the market for international long-distance aircraft, since Bombardier and Embraer do not make long-range aircraft. However, for medium-range routes, there is competition between these four, and a new entrant (COMAC in China).

If the products/services and geography can be defined narrowly enough to answer the first question as 'yes', the second question is 'are we at risk of competing prices down, or can we differentiate from the other duopolist?'

- If the industry is characterized by high fixed costs, which creates the incentive to lower prices to fill up capacity, then there is a greater risk of driving down prices. Neither duopolist appropriately considers the effect on the industry profits when they change prices – neither really cares if the other duopolist loses market share and profits when one of them lowers prices to gain on both counts. This has occurred, to some extent, in the aircraft manufacturing industry.
- If the competition between the duopolists is repeated very frequently (and in smaller purchase amounts), then it is easier to prevent a collapse of prices (because each duopolist can observe the other's behaviour and has plenty of opportunities to immediately respond to any price decrease). The large, infrequent nature of long-range aircraft purchases makes this harder in that industry.
- If the duopolists can offer differentiated products or services, they'll look more like monopolists in their particular offering. Boeing and

Airbus are playing this game: Boeing's 787 Dreamliner, their newest long-range aircraft option, is optimized for cost efficiency of operations and passenger comfort by utilizing carbon fibre materials; Airbus' A380 is the largest commercial aircraft, and lowers the cost per passenger by fitting more passengers on the aeroplane.

Duopolies have the potential to create economic profits for the two producers, but the level of those profits depends on how they interact with, and respond to, each other in the market over time (Tirole 1988: 209–238).

See Also

- ▶ [Bertrand Competition](#)
- ▶ [Industrial Organization](#)
- ▶ [Perfect Competition](#)

Reference

- Tirole, J. 1988. *The theory of industrial organization*. Cambridge, MA: The MIT Press.

Dynamic Capabilities

David J. Teece
 Berkeley Research Group, LLC, Emeryville,
 CA, USA
 Haas School of Business, University of
 California, Berkeley, Berkeley, CA, USA

Abstract

The dynamic capabilities framework, which emerged in the strategic management literature during the 1990s, appears to have become one of the dominant paradigms in the field. At a practical level, the managerial activities that support dynamic capabilities are the sensing of opportunities, the seizing of such opportunities and the transforming of the enterprise, as

needed. Dynamic capabilities reside within organizations and are shaped by organizational heritage and prior management decisions. Of particular significance are top management decisions and the manner in which management orchestrates strategic assets inside and outside the firm. An enterprise with strong dynamic capabilities will adapt to the business environment as changes occur. It can also shape that environment by joining with suppliers and complementors to co-create new markets and impact government policy and industry activity.

Definition Dynamic capabilities are the firm's ability to integrate, build and reconfigure internal and external resources to address and shape rapidly changing business environments.

An enterprise capability is a set of activities the firm performs in a routine or routinized fashion to enable a particular set of tasks to be accomplished in a manner that allows, against the opposition of circumstance, products and services to be made and/or delivered and profits to be generated. Ordinary capabilities involve the performance of those administrative-, operational- or governance-related functions that are (technically) necessary to complete tasks. Dynamic capabilities are higher-level activities that enable an enterprise to direct its activities (and those of complementors) towards producing goods and services in high demand or likely to be in high demand soon. Dynamic capabilities enable the firm to integrate, build and reconfigure internal and external resources to address and shape rapidly changing business environments.

The dynamic capabilities framework took shape during the 1990s in a series of articles by David Teece and co-authors (1990, 1997) and Teece and Pisano (1994). Since then, the framework has attracted a great deal of scholarly interest as a potentially overarching paradigm for the field of strategic management. It also implicitly propounds a new theory of the firm and of firm-level competitive advantage. The capabilities framework is best appreciated when juxtaposed against the economic theory of resource allocation via markets.

One of the most articulate scholars to espouse the market's virtues was Friedrich Hayek. Hayek stressed the amazingly parsimonious powers of the price system to coordinate disparate economic activities around the globe (Hayek 1945). However, Hayek failed to note that management likewise achieves complex resource coordination, albeit inside the firm, and also with the firm's alliance partners. But the latter is a very different kind of coordination, as it involves coordinating the development and deployment of idiosyncratic, non-traded (and hence non-priced) assets. Such managerial coordination or 'orchestration' functions thus become for the firm what prices are to the market, in that they both help achieve coordination. However, the analogy is not quite complete. Whereas market coordination is achieved with priced assets, managerial coordination is achieved with unpriced assets.

There is a degree of autonomy and atomicity attached to both types of coordination: the first is achieved by routines and buttressed by managers often making highly complex resource allocation decisions; the second is achieved by the price system generating signals that bring about responses by producers and consumers. Certainly the first is just as remarkable a resource allocation process as the process that Hayek observed with respect to prices and markets.

Precursors

The intellectual origins of the dynamic capabilities framework can be traced as far back as Joseph Schumpeter, with his theories of economic growth through innovation and entrepreneurship; and to historians like Alfred Chandler, who carefully chronicled the development of the capabilities of large corporations. Other important elements are rooted in the work of George Richardson (coordination of complementing investments), Nathan Rosenberg (complementary technologies), Richard Nelson and Sidney Winter (evolutionary economics), Oliver Williamson (asset specificity) and Edith Penrose (slack resources, resource fungibility and the growth of the firm). However, none

of these authors dug very deep, if at all, into the theoretical foundations of capabilities.

Richardson (1972) appears to have gone the furthest, although he did not go very far. He referred to knowledge, experience and skill as constituting 'capabilities', even though the capabilities of an organization may depend on ownership of (and access to) plant and equipment, too. He noted that organizations 'tend to specialize in activities for which their capabilities offer some comparative advantage' (p. 888). In the language of modern-day strategy, we would call this competitive advantage (i.e., the points of difference that enable a firm to generate above-average reforms).

Other intellectual antecedents include (but are by no means limited to) Abernathy and Utterback (innovation lifecycles), Dosi (technological paradigms), Kirzner and Knight (entrepreneurship), March and Simon (organizational learning and decision-making), Rumelt (isolating mechanisms) and Tushman (competency-enhancing and competency-destroying innovation). Key insights have also come from the work of behavioural economists such as Kahneman and Tversky.

From a strategy perspective, the proximate origins of the dynamic capabilities framework can be found in part in the ► [resource-based view](#) of the firm. The 'resources' approach builds on the research of Penrose (1959), Rubin (1973) and others. Much of Penrose's work focuses on enterprise growth.

In the 1980s, a number of strategic management scholars, including Rumelt (1984) and Teece (1980, 1982, 1984), built up theories of competitive advantage and firm diversification and growth using Penrosean ideas of resource fungibility. Wernerfelt (1984), Barney (1986) and others picked up these loose threads and shaped a theory of competitive advantage around the notion that a firm may earn rent from leveraging its unique resources (which are difficult to monetize directly via transactions in intermediate markets). Later, Barney made an important distinction between VRIN (valuable, rare, inimitable and non-substitutable) resources and all other resources.

In the dynamic capabilities framework, VRIN 'resources' are seen to be firm-specific (mostly

intangible) assets that are difficult to imitate or otherwise replicate. Examples include technologies protected by intellectual property, process know-how, customer relationships and the knowledge possessed by groups of especially skilled employees. Intangible resources are typically not identifiable at all in financial statements prepared for investors, except perhaps in a line item for 'goodwill' related to an acquired firm.

VRIN resources – particularly intellectual capital – are idiosyncratic in nature. They are also costly to create and difficult to trade because their property rights are likely to have fuzzy boundaries and their value is context-dependent. As a result, there is no well-developed market for most types of resources/intellectual capital; in fact, they are typically not traded at all. They are also often quite difficult to transfer among firms simply from a management (let alone transactions) perspective (Teece 1981). Resources are thus potentially one basis of particular types of competitive advantage.

The resource-based view was an important development that took competitive analysis beyond the prevailing economic view that business success comes mainly from heightened efficiency and the creation of barriers to entry. The resources approach recognized heterogeneity among firms and accorded well with the sense of many practitioners, especially in high-tech industries, that sustainable success requires not simply clever strategic positioning and the creation of barriers to entry but the laborious accumulation and astute orchestration and deployment of superior technological and organizational assets.

However, the resource-based approach is inherently static. It views know-how as stocks of disembodied knowledge; the capabilities approach, by contrast, sees it as manifested in the organizations' ongoing activities. As noted in Teece and colleagues (1997: 515): 'The global competition battles in high-technology industries such as semiconductors, information services, and software have demonstrated the need for an expanded paradigm to understand how competitive advantage is achieved.'

As noted, the resources approach has a fundamental problem: it is static and pays no attention

to how such assets are created, protected and leveraged. The resources approach fails to pursue the question of how competitive advantage is achieved and how firms develop or acquire new competences and adapt when circumstances change. The dynamic capabilities approach endeavours to respond to these omissions. It is, nevertheless, clear that the resources approach and dynamic capability are part of a broader mosaic that can help explain competitive advantage. The VRIN characteristics of resources make certain resources competitively significant, at least in the present.

Insights from dynamic capabilities stemming from the resource-based approach include the following: to be valuable, a resource is likely to be rare. There is a confounding of 'rare' and 'valuable' inasmuch as it is hard to identify an asset that is valuable that is not somewhat rare. Unfortunately, the resources approach does not explain how making a resource valuable can be the product of the firm's own actions (e.g., its heritage, its investment in R&D). Likewise, another VRIN factor – non-substitutability – smacks of scarcity and so is a confounding factor with rare. Nevertheless, the VRIN factors do suggest a screen. However, these screens are themselves implicated with dynamic capabilities. The generation or 'creation' of resources that meet VRIN criterion in turn requires something else, and dynamic capabilities are part of the answer. That something else is often investment in new product and process innovation coupled with strategically savvy but path-dependent entrepreneurial actions of management, which enable the firm to generate resources that meet VRIN criterion.

Perhaps more importantly, the resource-based theory is almost silent on the role that management plays in establishing and protecting competitive advantage. As already noted, the VRIN factors beg the question of how the firm gets to create valuable, rare, inimitable and non-substitutable resources.

Put differently, there are little or no hints in the resources-based approach as to how firms structure resource portfolios, bundle up resources to create capabilities, and then leverage created capabilities to take advantage of opportunities

and guard against threats. This is the focus of the dynamic capabilities framework, where various types of ► [asset orchestration](#) play critical roles.

Processes, Routines and Capabilities

A capability, ordinary or dynamic, can be harnessed to produce outcomes. A capability is not about an organization's intentions, motivations or strategy, although strategy may be implicated. Capabilities are not appropriately summarized by a production function or functions. They are about what the organization can actually accomplish. Capabilities arise from organizational histories and are, in turn, shaped in part by managerial decisions; such decisions create, mould and deploy a capability (Dosi et al. 2008).

Capabilities, like resources, are untethered from particular purposes or products (e.g., a capability to make small, compact internal combustion engines can manifest itself in the manufacturing of automobiles, outboard (marine) motors or lawn mowers). This is close to Edith Penrose's notion of 'fungibility'.

Strong dynamic capabilities are unlikely, on their own, to result in competitive advantage. As discussed below, *strategy* is implicated, too.

Dynamic Capabilities Framework

The dynamic capabilities framework is now well established in the field of strategic management. Teece et al. (1990, 1997) wrote early definitional articles on the subject. 'Dynamic capabilities and strategic management', published in 1997, is one of the most cited papers in business and economics. Since 2006, articles concerning dynamic capabilities have been published in business and management journals at a rate of more than 100 per year (Di Stefano et al. 2010). An increasing number of these articles contain new empirical research. The framework posits that firms are, to varying degrees, able to adapt to (or even initiate) changes in the business environment.

The strength of a firm's dynamic capabilities determines the speed and degree to which the

firm's idiosyncratic resources/competences can be aligned and realigned consistent with the firm's strategy, and to match the opportunities and requirements of a changing business environment. It is hypothesized that strong dynamic capabilities and good strategy are the basis for the sustained competitive advantage displayed by a handful of firms that have endured for decades, even as they may have shifted the focus of their activities.

In the earlier versions of dynamic capabilities (Teece et al. 1997) three processes are recognized as core to dynamic capabilities: (1) coordinating/integrating, (2) learning and (3) reconfiguration. Integration and coordination routines involve combining resources, such as with the new product development process. Learning is an outcome of practice and experimentation and allows tasks to be performed effectively. Reconfiguration refers to transformation, which in turn requires recombining existing resources. In Teece (2007), 'asset orchestration' is identified as a meta-process that envelops and engages all three processes.

Not all business processes and business models support dynamic capabilities – only those that yield value-enhancing differentiation constitute genuine dynamic capabilities. Such processes are usually quite unique and firm-specific and may be thought of as 'signature processes' or 'signature business models'. These arise from the firm's organizational heritage and so are difficult for competitors to imitate. Past activities are likely also to have led to certain irreversible investments, which shape organizational heritage. They are another source of heterogeneity and path dependency (Jacobides and Winter 2012).

Other scholars have offered similar concepts with somewhat different terminology. Adner and Helfat (2003) and Helfat and colleagues (2007) decompose asset orchestration into two primary processes: search/selection and configuration/development.

As discussed below, and in order to make dynamic capabilities more operational, Teece (2007) identifies three types of 'orchestration' processes/activities: sensing, seizing and transforming. Teece (2007) and Sirmon and Hitt

(2007) emphasize the requirement of ‘fit’ (i) amongst these processes and (ii) with the business environment. If the organization can achieve tight fit, it is likely to have strong dynamic capabilities.

Dynamic capabilities require entrepreneurial activity (as several elements of orchestration are inherently entrepreneurial). As noted, asset orchestration (and coordination) performed by management lies at the core of dynamic capabilities (the question of just how top management’s competency impacts enterprise performance and flows through to management compensation has been studied by Castanias and Helfat (1991)).

Although dynamic capabilities is a framework rather than a full-fledged theory, at least some of its assertions and implications are empirically testable. Empirical validation is still in its early stages. Careful studies of the successes and failures of specific enterprises have already provided a great deal of support. Statistical evidence shows that differences in profitability and firm growth persist over time (Helfat et al. 2007), which is consistent with the hypothesis that dynamic capabilities support differentiation and superior long-term returns for some companies. There are also a small but growing number of studies that have operationalized various aspects of dynamic capabilities for statistical tests, and these have generally confirmed the importance of specific capabilities for higher firm performance (e.g., Morgan et al. 2009).

Ordinary Capabilities

An understanding of dynamic capabilities can be sharpened by comparing them with ordinary capabilities. Capabilities are often knowledge based and developed through experiential organizational learning. Once developed, they can often be codified and then transformed. Transfer and replication make some resources ‘ordinary’.

Ordinary capabilities permit sufficiency (and occasionally excellence) in the performance of a well-delineated task. They generally fall into three categories: administration, operations and governance. Ordinary capabilities are embedded in

some combination of (1) skilled personnel, including, under certain circumstances, independent contractors; (2) facilities and equipment; and (3) processes and routines, including any supporting technical manuals and the administrative coordination needed to get the job done. Strong ordinary capabilities are an indication that the firm has achieved ‘best practices’ and owns or has access to skilled people and advanced equipment.

Ordinary capabilities are usually in the public domain; hence, they can be ‘bought’. Best practices are, in this sense, ordinary. Ordinary capabilities can be measured against the requirements of specific tasks, such as supply chain management, and thus benchmarked internally or externally to industry best practice. Best operational practices are those that increase speed, quality and efficiency. Best practices can be thought of as those that ‘continuously collect and analyze performance information, that set challenging and interlinked short- and long-run targets, and that reward high performers and retrain/fire low performers’ (Bloom et al. 2012: 13). Studies (e.g., Eisenhardt and Martin 2000) have provided details of the routines and processes that undergird ordinary capabilities. Unfortunately, the literature often fails to differentiate between ordinary and dynamic capabilities.

A firm’s ordinary capabilities enable the production and sale of a defined (but static) set of products and services. However, best practices alone are generally insufficient to undergird sustainable competitive advantage. In particular, the presence of ordinary capabilities says nothing about whether the current production schedule is the right (or even a profitable) path to follow in the future. When the firm’s output is tuned to what the market desires, strong ordinary capabilities may be sufficient for competitive advantage, but only until conditions change.

Even when the production supported by ordinary capabilities is well suited to the current competitive environment, ordinary capabilities suffer from a key weakness in that much of the know-how underlying them is highly explicit, and therefore easy to copy. Imitation is thus likely, over a relatively short period of time, to erode any

advantage that rests on strong ordinary capabilities alone.

Another weakness can occur when the relentless pursuit of efficiency drives out the capacity to change and organizations become sclerotic, as efficiency is easier to obtain if the set of tasks the organization is to perform becomes a fixed state.

Bloom and colleagues (2012) found that multinationals build some of their advantage around ordinary capabilities because they are able to transfer their management practices to each country in which they operate; multinationals typically have the best practices within each country. Technologies and capabilities that are ordinary in one country may be distinctive in another, at least until they are copied – or until the business environment changes.

Dynamic Capabilities as an Enabler

Dynamic capabilities enable an enterprise to profitably orchestrate its competences and other assets both within and beyond the organization, reconfiguring them as needed to respond to (or bring about) changes in the market and in the business environment more generally (Pisano and Teece 2007). They allow the organization (especially its top management) to develop conjectures about the evolution of markets and technology, validate them and realign assets and competences to meet these new requirements. The requirements of dynamic capabilities will be at odds with cultural norms that focus on resources, cherish the status quo, and fail to empower entrepreneurs and change agents.

Whereas strong ordinary capabilities are built on best practices, dynamic capabilities are founded on signature practices and employ differentiated business models. Signature practices arise from a company's heritage and business models, including its prior management actions and context-specific learning (Gratton and Ghoshal 2005).

The essence of dynamic capabilities is that they cannot generally be bought (apart from acquiring the entire organization); they must be built. They

are often highly context-specific. The growth and potential transformation of the enterprise envisioned when an enterprise has strong dynamic capabilities go beyond the notion of 'strategic fit' seen as optimal in the 'adaptation' school of organizational change research, which holds the environment to be exogenous; and it is virtually orthogonal to the bleak strategic management message from the ► **organizational ecology** school of research (e.g., Hannan and Freeman 1977). The organizational ecology school holds that, when the business environment shifts, incumbent firms face overwhelming inertia due to micro-political social practices and 'bargains' inside the company, and are, as a result, replaced by organizations better suited to the changed context. Although there is evidence of organizational inertia, the dynamic capabilities framework holds that management can overcome evolutionary forces to some degree (O'Reilly and Tushman 2008). High-inertia organizations are simply those with weak dynamic capabilities. The changes that have occurred in the course of the long and not so long histories of numerous leading corporations, such as Nokia, GE, IBM and Apple, suggest that this is true in practice. In other words, while path dependence poses a constraint on the future actions of all enterprise, it also constitutes the foundation of future growth for the best of them.

Types of Dynamic Capabilities

Dynamic capabilities are not binary in nature; that is, it is not a matter of having them or not having them. Instead, an enterprise's dynamic capabilities at a point in time will lie on a spectrum between strong and weak. If weak, they will retard performance. If strong, they will enhance it. Moreover, there are many elements to dynamic capabilities, each of which may be stronger or weaker.

At a practical level, dynamic capabilities can usefully be broken down into three primary clusters: (1) identification and assessment of an opportunity (*sensing*); (2) mobilization of resources to address an opportunity and to capture value from doing so (*seizing*); and (3) continued renewal

(*transforming*). Sensing, seizing and transforming are essential if the firm is to sustain itself as markets and technologies change.

‘Sensing’ is an inherently entrepreneurial set of capabilities that involves exploring technological opportunities, probing markets and listening to customers, along with scanning the other elements of the business ecosystem. It requires management to build and test hypotheses about market and technological evolution, including the recognition of latent demand. The world wasn’t clamouring for a coffee house on every corner, but Starbucks, under the guidance of Howard Schultz, recognized and then successfully developed and exploited this potential new market. As this example implies, sensing requires managerial insight and vision – or an analytical process embedded in the enterprise that can serve as a proxy for it. Sensing benefits from the application of data analytics to real-time market data to spot trends, anomalies and patterns. The ability to sense different ways of doing things is the precursor to choosing among them.

Once opportunities are sensed, choices must be made, and investment follows. The structure and assets of the organization help shape the choices made. ‘Seizing’ includes implementing the choice of business model to satisfy customers, shaping markets and market outcomes, and capturing value. Large cash balances provide the financial flexibility that aids dynamic capabilities. Ready access to external capital and top talent helps. Employee motivation and cultural alignment is vital. Good incentive design is a necessary but not sufficient condition for superior performance in this area. Strong relationships must also be forged externally with suppliers, complementors and customers, with the boundaries of the firm drawn to avoid (or at least limit) the loss of profits to the owner of an external ‘bottleneck’ asset (Teece 1986). Cooperation is often part of the ecosystem occupied by firms with strong dynamic capabilities. Put differently, firms with dynamic capabilities both cooperate and compete.

In short, capabilities almost always depend on implementing a good business model and harnessing assets both within and beyond the traditional boundaries of the firm. It likely stretches

the entire width of the business ecosystem. Understanding the evolving business ecosystem helps in the understanding of business model choice, too.

‘Transforming’ capabilities that realign the enterprise’s resources are needed most obviously when radical new opportunities are to be addressed. But they are also needed periodically to soften the rigidities that develop over time from asset accumulation, standard operating procedures and insider misappropriation of rent streams. A firm’s assets must also be kept in strategic alignment vis-à-vis its ecosystem. Complementarities need to be constantly managed (reconfigured as necessary) to achieve evolutionary fitness, limiting loss of value in the event that market leverage shifts to favour external complements.

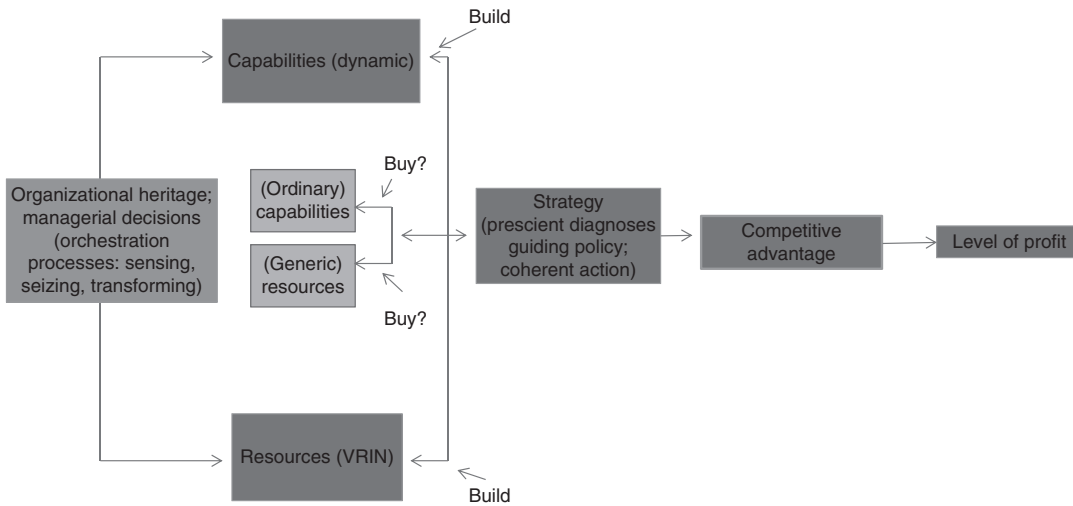
Strategy and Dynamic Capabilities

Dynamic capabilities, although essential for creating sustainable competitive advantage, must still be used in aid of, and in conjunction with, a good strategy in order to be effective. Strategy, capabilities and the business environment co-evolve. Nonetheless, a strategy that is consistent, coherent and accommodating of innovation is needed to help achieve competitive advantage. A firm with strong dynamic capabilities is able to flesh out the details around strategic intent and to implement strategic actions quickly and effectively.

A strategy can be defined as ‘a coherent set of analyses, concepts, policies, arguments, and actions that respond to a high-stakes challenge’ (Rumelt 2011: 6). For Rumelt, a good strategy has (1) a diagnosis, (2) a guiding policy and (3) coherent action.

This trio moves from analysis to vision to operations; in contrast, dynamic capabilities is more naturally described as a sequence that starts with the visionary sensing process and then passes on to operational seizing activities. The key is that Rumelt and others see strategy as a response to challenges that need to be surmounted, hence the need for an accurate diagnosis.

The dynamic capabilities framework also encompasses the entrepreneurial creation of new



Dynamic Capabilities, Fig. 1 Logical structure of the dynamic capabilities paradigm

markets where opportunities that may exist only in the mind of an entrepreneurial manager, and not just ‘challenges’, are the impetus to action.

Hence, dynamic capabilities and business strategy co-determine performance (Fig. 1). Some scholars (e.g., Arend and Bromiley 2009) seem to believe that the framework is tautological. This is not the case, as Fig. 1 makes apparent. Firms with weaker capabilities will require different strategies to firms with stronger capabilities. Strong dynamic capabilities can become worthless if they are tied to a poor or badly misjudged strategy, and vice versa.

Conclusion

The dynamic capabilities framework emphasizes the need to look beyond ensuring that a business runs smoothly. The latter constitutes technical efficiency, which is relatively easy to achieve. The ability to dynamically formulate and execute strategy, achieve alignment with markets and shape them where possible is the essential requirement for durable enterprise growth and profitability. Managers at all levels must look around and ahead to detect and respond to opportunities and threats. Strong dynamic capabilities allow an

organization or business unit to not only do things right but also do what is necessary to stay (or become) competitive.

See Also

- ▶ [Asset Orchestration](#)
- ▶ [Business Model, the](#)
- ▶ [Dynamic Managerial Capabilities](#)
- ▶ [Firm Resources](#)
- ▶ [Learning and Adaptation](#)
- ▶ [Organizational Ecology](#)
- ▶ [Resource-Based View](#)

References

- Adner, R., and C.E. Helfat. 2003. Corporate effects and dynamic managerial capabilities. *Strategic Management Journal* 24: 1011–1025.
- Arend, R., and P. Bromiley. 2009. Assessing the dynamic capabilities view: Spare change, everyone? *Strategic Organization* 7: 75–90.
- Barney, J.B. 1986. Strategic factor markets: Expectations, luck, and business strategy. *Management Science* 32: 1231–1241.
- Bloom, N., C. Genakos, R. Sadun, and J. Van Reenen. 2012. Management practices across firms and countries. *Academy of Management Perspectives* 20: 12–33.

- Castanias, R.P., and C.E. Helfat. 1991. Managerial resources and rents. *Journal of Management* 17: 155–171.
- Di Stefano, G., M.A. Peteraf, and G. Verona. 2010. Dynamic capabilities deconstructed: A bibliographic investigation into the origins, development, and future directions of the research domain. *Industrial and Corporate Change* 19: 1187–1204.
- Dosi, G., M. Faillio, and L. Marengo. 2008. Organizational capabilities, patterns of knowledge accumulation and governance structures in business firms: An introduction. *Organizational Studies* 29: 1165–1185.
- Eisenhardt, K., and J. Martin. 2000. Dynamic capabilities: What are they? *Strategic Management Journal* 21: 1105–1121.
- Gratton, L., and S. Ghoshal. 2005. Beyond best practice. *Sloane Management Review* 46: 49–57.
- Hannan, M.T., and J. Freeman. 1977. The population ecology of organizations. *American Journal of Sociology* 82: 929–964.
- Hayek, F.A. 1945. The use of knowledge in society. *American Economic Review* 35: 519–530.
- Helfat, C.E., S. Finkelstein, W. Mitchell, M.A. Peteraf, H. Singh, D.J. Teece, and S.G. Winter. 2007. *Dynamic capabilities: Understanding strategic change in organizations*. Oxford: Blackwell.
- Jacobides, M.G., and S.G. Winter. 2012. Capabilities: Structure, agency, and evolution. *Organizational Science* 23: 1365–1381.
- Morgan, N.A., D.W. Vorhies, and C.H. Mason. 2009. Market orientation, marketing capabilities, and firm performance. *Strategic Management Journal* 30: 909–920.
- O'Reilly, C.A., and M. Tushman. 2008. Ambidexterity as a dynamic capability: Resolving the innovator's dilemma. *Research in Organizational Behavior* 28: 185–206.
- Penrose, E.G. 1959. *The theory of the growth of the firm*. New York: Wiley.
- Pisano, G.P., and D.J. Teece. 2007. How to capture value from innovation: Shaping intellectual property and industry architecture. *California Management Review* 50: 278–296.
- Richardson, G.B. 1972. The organization of industry. *The Economic Journal* 82: 883–896.
- Rubin, P.H. 1973. The expansion of firms. *Journal of Political Economy* 81: 936–949.
- Rumelt, R.P. 1984. Towards a strategic theory of the firm. In *Competitive strategic management*, ed. R.B. Lamb. Englewood Cliffs: Prentice Hall.
- Rumelt, R.P. 2011. *Good strategy/bad strategy: The difference and why it matters*. New York: Crown Business.
- Simon, D.G., and M.A. Hitt. 2007. Managing firm resources in dynamic environments to create value: Looking inside the black box. *Academy of Management Review* 32: 273–292.
- Teece, D.J. 1980. Economies of scope and the scope of the enterprise. *Journal of Economic Behavior & Organization* 1: 223–247.
- Teece, D.J. 1981. The market for know-how and the efficient international transfer of technology. *Annals of the Academy of Political and Social Science* 458: 81–96.
- Teece, D.J. 1982. Towards an economic theory of the multiproduct firm. *Journal of Economic Behavior & Organization* 3: 39–63.
- Teece, D.J. 1984. Economic analysis and strategic management. *California Management Review* 26: 87–110.
- Teece, D.J. 1986. Profiting from technological innovation. *Research Policy* 15: 285–305.
- Teece, D.J. 2007. Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal* 28: 1319–1350.
- Teece, D.J., and G. Pisano. 1994. The dynamic capabilities of firms: An introduction. *Industrial and Corporate Change* 3: 537–556.
- Teece, D.J., G. Pisano, and A. Shuen. 1990. *Firm capabilities, resources, and the concept of strategy*. CCC Working paper No. 90-8. Berkeley: Center for Research in Management, University of California, Berkeley.
- Teece, D.J., G. Pisano, and A. Shuen. 1997. Dynamic capabilities and strategic management. *Strategic Management Journal* 18: 509–533.
- Wernerfelt, B. 1984. A resource-based view of the firm. *Strategic Management Journal* 5: 171–180.

Dynamic Managerial Capabilities

Dawn Harris¹ and Constance E. Helfat²

¹Loyola University Chicago, Chicago, IL, USA

²Dartmouth College, Dartmouth, NH, USA

Abstract

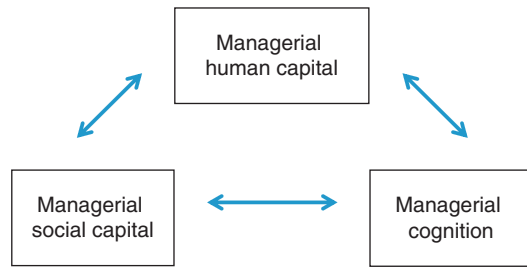
Dynamic managerial capabilities refer to the capacity of managers to create, extend or modify the way in which an organization makes a living in for-profit firms, or fulfils its mission in non-profit organizations. Through their dynamic capabilities, managers may affect both the internal attributes of an organization and its external environment. Managers can use their dynamic capabilities to shape the development and deployment of organization-level dynamic capabilities and to alter existing organizational resources and capabilities. Both top and middle managers may possess dynamic managerial capabilities. Dynamic managerial capabilities derive from managerial human capital, managerial social capital and managerial cognition.

Definition Dynamic managerial capabilities refer to the capacity of managers to create, extend or modify the way in which an organization makes a living in for-profit firms, or fulfils its mission in non-profit organizations, including through changes in organizational resources and capabilities. Dynamic managerial capabilities derive from managerial human capital, managerial social capital and managerial cognition.

Adner and Helfat (2003: 1020) originally defined dynamic managerial capabilities as ‘the capabilities with which managers build, integrate, and reconfigure organizational resources and competences’. Similarly, Helfat and colleagues (2007: 3) used the term to refer to ‘the capacity of managers to create, extend, or modify the resource base of the organization’. More generally, dynamic managerial capabilities refer to the capacity of managers to create, extend or modify the way in which an organization makes a living in for-profit firms, or fulfils its mission in non-profit organizations. Thus, managers may affect both the internal attributes of an organization and its external environment.

Both top and middle managers may possess dynamic managerial capabilities. Teece (2007: 1346) focused on managers at the top of the organization, arguing that ‘dynamic capabilities reside in large measure with the enterprise’s top management team’. O’Reilly and Tushman (2008: 187) also emphasized ‘the key role of strategic leadership in appropriately adapting, integrating and reconfiguring organizational skills and resources to match changing environments’. In particular, the dynamic capabilities of top management can enable ambidextrous organizational change through exploration of new businesses as well as exploitation of mature businesses (O’Reilly and Tushman 2008). Harris et al. (2011) focused on the coordination between top executives, a managerial process that can lead to the formation of a dynamic capability. Below the top team, Martin (2011) has provided empirical evidence of dynamic capabilities on the part of general managers in charge of business units in the software industry.

Adner and Helfat (2003) pointed to three underlying drivers of dynamic managerial



Dynamic Managerial Capabilities, Fig. 1 Dynamic managerial capabilities (Adapted from Adner and Helfat 2003)

capabilities: managerial human capital (e.g., Harris and Helfat 1997), managerial social capital and managerial cognition (see Fig. 1). These drivers interact; together and separately they affect the capacity of managers to alter the ways in which firms make a living. Although a good deal of research has documented managerial cognitive barriers to change, as in Polaroid’s failure to enter the digital camera market (Tripsas and Gavetti 2000), other research has documented that the cognition of top managers can promote strategic change. In an analysis of NCR, Rosenbloom (2000) demonstrated the impact that the dynamic capabilities of a new CEO, and particularly his cognition, had on the company’s successful (albeit belated) entry into mainframe computing. Additionally, in an empirical analysis of fibre optics communication technology, Eggers and Kaplan (2009) measured managerial cognition in terms of CEO attention. They found that this aspect of dynamic managerial capabilities had a positive impact on the ability of incumbent firms to adapt to radical technological change through faster entry into an evolving new market. Recently, based on this and other evidence, Helfat and Peteraf (2011) developed a conceptual framework that explains how the ‘cognitive capabilities’ of managers underpin dynamic managerial capabilities.

Managers can use their dynamic capabilities to shape the development and the deployment of organization-level dynamic capabilities. Harrell et al. (2007), in an analysis of IBM, highlighted the substantial role of the senior management team in developing organizational dynamic capabilities. Helfat and colleagues (2007) provided

evidence of both successful and unsuccessful managerial deployment of organization-level dynamic capabilities at Rubbermaid and Quaker Oats.

Managers can also directly alter the resources and capabilities of an organization. Helfat and colleagues (2007) and Augier and Teece (2009) pointed to the importance of managerial ‘orchestration’ of assets through (re)configuration and alignment of organizational capabilities and resources, including complementary and co-specialized assets. In an empirical analysis of firms in the banking industry, Sirmon and Hitt (2009) found that ► [asset orchestration](#) through resource investment and deployment worked best when managers made congruent rather than independent resource investment and deployment decisions. Similarly, Peteraf and Reed (2007), in an empirical study of the airline industry after deregulation, suggested that the ability to achieve internal fit could constitute a dynamic managerial capability to adapt to external change.

See Also

- [Asset Orchestration](#)
- [Dynamic Capabilities](#)
- [Firm Resources](#)
- [Managerial Resources and Capabilities](#)
- [Organizational Ambidexterity](#)
- [Upper Echelons Theory](#)

References

- Adner, R., and C.E. Helfat. 2003. Corporate effects and dynamic managerial capabilities. *Strategic Management Journal* 24: 1011–1025.
- Augier, M., and D.J. Teece. 2009. Dynamic capabilities and the role of managers in business strategy and economic performance. *Organization Science* 20: 410–421.
- Eggers, J.P., and S. Kaplan. 2009. Cognition and renewal: Comparing CEO and organizational effects on incumbent adaptation to technical change. *Organization Science* 20: 461–477.
- Harrel, J., C. O’Reilly, and M. Tushman. 2007. Dynamic capabilities at IBM: Driving strategy into action. *California Management Review* 49: 21–43.
- Harris, D., and C.E. Helfat. 1997. Specificity of CEO human capital and compensation. *Strategic Management Journal* 18: 895–920.
- Harris, D., F. Kaefer, and L. Salchenberger. 2011. *The development of dynamic capabilities through organizational and managerial processes*. Working paper, Quinlan School of Business, Loyola University Chicago.
- Helfat, C.E., and M.A. Peteraf. 2011. *Cognitive capabilities and the microfoundations of dynamic managerial capabilities*. Working paper, Tuck School of Business, Dartmouth.
- Helfat, C.E., S. Finkelstein, W. Mitchell, M.A. Peteraf, H. Singh, D.J. Teece, and S.G. Winter. 2007. *Dynamic capabilities: Understanding strategic change in organizations*. Malden: Blackwell Publishing.
- Martin, J.A. 2011. Dynamic managerial capabilities and the multi-business team: The role of episodic teams in executive leadership groups. *Organization Science* 22: 118–140.
- O’Reilly, C., and M. Tushman. 2008. Ambidexterity as a dynamic capability: Resolving the innovator’s dilemma. *Research in Organizational Behavior* 28: 185–206.
- Peteraf, M.A., and R. Reed. 2007. Managerial discretion and internal alignment under regulatory constraints and change. *Strategic Management Journal* 28: 1089–1112.
- Rosenbloom, R.S. 2000. Leadership, capabilities, and technological change: The transformation of NCR in the electronic era. *Strategic Management Journal* 21: 1083–1104.
- Sirmon, D.G., and M.A. Hitt. 2009. Contingencies within dynamic managerial capabilities: Interdependent effects of resource investment and deployment on firm performance. *Strategic Management Journal* 30: 1375–1394.
- Teece, D.J. 2007. Explicating dynamic capabilities: The nature and microfoundations of (sustainable) business enterprise. *Strategic Management Journal* 28: 1319–1350.
- Tripsas, M., and G. Gavetti. 2000. Capabilities, cognition, and inertia: Evidence from digital imaging. *Strategic Management Journal* 21: 1147–1162.

Dynamics of Resource Erosion, the

Ingemar Dierickx¹, Karel Cool² and
Luis Almeida Costa³

¹ID Consulting Ltd, Burnside, Christchurch,
New Zealand

²INSEAD, Fontainebleau, France

³Universidade Nova de Lisboa, Lisbon, Portugal

Abstract

This entry discusses patterns of resource erosion (alternatively called resource decay, leakage, depreciation). Taking a stocks-flows perspective, erosion is conceptualized as the loss of value per period (e.g., a year) of an asset stock

(e.g., R&D capital, brand loyalty) as a consequence of a variety of mechanisms (e.g., R&D spillovers, customers leaving, expiration of a patent). The entry discusses two patterns of erosion, linear and exponential, and explores their strategic implications. It also discusses some unexpected outcomes that may result from the combined effect of common growth and decay patterns, as well as additional difficulties that stem from inference lags.

Definition Resource erosion dynamics are patterns in the loss of value of a resource (e.g., R&D capital, brand loyalty) as a consequence of a variety of mechanisms (e.g., R&D spillovers, customers leaving the market).

Resources as Asset Stocks

Many resources are the cumulative result of a series of investments over a period of time (Dierickx and Cool 1989). For example, a firm's reputation for quality is the result of a consistent set of policies on production and quality control, a consistent investment in communication with customers and so forth. Similarly, a business school's key resource, its reputation for excellence in teaching and research, reflects its past investments in faculty, the faculty's investment in research and teaching, 'word-of-mouth' advertising of its alumni base and so on. More generally, we can state that resources are *stocks*, which are accumulated over time by a stream of investments or *flows*.

It may be useful to provide an intuitive anchor to visualize resources as asset stocks. A resource may be pictured as the amount of water in a 'bathtub'. This is the cumulative result of flows of water into the tub through the tap and out of it through a hole. Similarly, the 'level' of an asset stock is the cumulative result of investment flows, which build the asset, and outflows that erode the asset over time. In the example of R&D, the amount of water in the tub represents the stock of know-how at a particular moment in time. The fact that know-how depreciates and that private knowledge becomes common knowledge is represented by the flow of water leaking through the hole in the tub.

Investment flows are *control variables*, which can be adjusted directly. In contrast, asset stocks are *state variables*, which adjust over time according to a differential equation, called 'equation of motion'. This equation expresses the rate of change of an asset stock as a function of the various flows. While firms can directly control flows, *it takes time to reach a new resource level*. The time required to reach a desired level of a particular asset stock depends not only on quantitative factors such as the difference between the initial and the desired levels of the asset stock, and the magnitude of the various flows such as investment and erosion, but also on the *functional characteristics of the equation of motion*.

The fact that adjusting stocks takes time lies at the heart of the sustainability of ► [competitive advantage](#) (Wernerfelt 1984, 2011; Barney 1986; Dierickx and Cool 1989; Conner 1991; Amit and Schoemaker 1993; Peteraf 1993; Teece et al. 1997; Cool et al. 2002; Peteraf and Barney 2003; Barney and Clark 2007; Pacheco de Almeida 2010). Stock-flow dynamics imply that it will take time for competitors to catch up with the firm that has a higher asset stock level. Several characteristics of the equation of motion influence the time and cost of imitation. Some relate to ► [asset mass efficiencies](#) where '(initial) success breeds (further) success', helping first movers to sustain their lead. A second set of processes relate to *diseconomies of time compression*, that is, the time-cost trade offs in the accumulation and imitation of resources (Pacheco de Almeida and Zemsky 2007). A third set relates to the *erosion* or decay of resources, which weakens the stock level advantage of first movers. The characteristics of these three processes – accumulation, imitation and erosion – provide an analytic framework for assessing resource uniqueness, a key determinant of the sustainability of competitive advantage.

This entry focuses on the dynamics of resource erosion. Two common erosion patterns are contrasted: linear and exponential decay. Their strategic implications are illustrated with numerical examples and a variety of industry examples. In addition, the paper highlights unexpected outcomes that may result from the combined

effect of common growth and decay patterns, as well as additional difficulties that stem from inference lags.

Linear Decay

Assets stocks that lose a constant amount of value or the same number of units per period decay in a linear manner. For example, when a firm loses 100 customers every year, the equation of motion is simply

$$\frac{dS(t)}{dt} = -100 \quad (1)$$

and its customer base $S(t)$ declines from its initial level S_0 in a straight line:

$$S(t) = S_0 - 100t. \quad (2)$$

If the initial level of customers S_0 stands at 1000, the customer base will be depleted in 10 years' time.

As the rate at which asset stocks erode is independent of the initial asset stock S_0 , initial asymmetries between stocks of different size or value are maintained. If, for example, R&D capital stocks of firms were to decay in a linear manner, asymmetries between large and small firms would persist.

Physical assets such as inventories and non-renewable natural resources decay linearly when they are drawn down at a constant rate. For example, an ore body decays linearly if the same tonnage is mined every year. Similarly, the stock of travellers waiting in a boarding area declines linearly when they are filtering through a security checkpoint at a constant rate. Intangible assets such as regulatory permits, operating licences and patents that have a fixed statutory lifetime decay linearly as well, as their remaining life declines over time.

It is worth noting, however, that while a stock may be decaying in a linear manner when it is expressed in numbers of units (e.g., amount of tons of ore), the *value* of the same stock may be decaying in a non-linear manner. For example, the

cost to extract ore typically increases towards the end of the life of a mine, resulting in a non-linear decrease in the value of the mine even though the number of tons of ore that is extracted may remain constant. Similarly, the value of a patent may be eroding by a larger amount per year towards the end of its life than at the beginning as a consequence of rival imitation that becomes more effective the more the patented technology is known. In a similar vein, the value of a third party's patented software that provides additional functionality to IBM Lotus Notes[®] is not decaying linearly over time, since the population of Lotus Notes users is declining.

Note also that it is not because the accumulation process of an asset is linear that its erosion will also be linear. For example, a house is built 'brick-by-brick', but the decay of the building, if not maintained, will probably not be linear. Initially, the state of the house will not be much affected by the lack of maintenance. Yet, as an increasing number of interdependent parts start to malfunction, the decay will accelerate until the building, ultimately, becomes a heap of rubble.

In short, linear decay is not very common. In fact, the example of the firm's customer base that is losing 100 customers each year to illustrate linear decay is not realistic. Most likely, the firm would not lose the same number of customers year after year. More realistically, yearly losses would be proportional to its customer base and thus follow an exponential pattern.

Exponential Decay

When assets erode at a constant *percentage rate* rather than a constant amount, decay is exponential. In such cases, the equation of motion is given by:

$$\frac{dS(t)}{dt} = -rS(t) \quad (3)$$

where $r > 0$ is the constant proportional rate of decay. Solving the simple differential Eq. 1 gives the familiar exponential decay equation for $S(t)$

$$S(t) = S_0 e^{-rt} \quad (4)$$

Exponential decay is ubiquitous in a variety of scientific disciplines including physics (e.g., the decay of radioactive elements, or Newton’s Law of Cooling), medicine (e.g., loss of muscle mass due to immobilization or ageing, memory loss), finance (discounting), population dynamics and so on. Similarly, although tax authorities typically stipulate linear depreciation of assets over their ‘useful life’, the underlying reality is usually that these assets are decaying exponentially. And, of course, there is the well-known example of the family car that loses, say, 20% of its value every year.

Exponential decay also characterizes a broad array of asset stocks such as brand recognition, brand loyalty and R&D know-how. In the case of brand recognition and loyalty, the multiplier effect of the erosion process gives rise to an exponentially decreasing customer base. The astounding decline of Arthur Andersen, one of the ‘big-five’ auditing firms, started in 2002 when some blue-chip clients left the company following the revelation of Andersen’s part in the Enron scandal. This triggered the departure of a number of other clients, which snowballed into a massive loss of clients and, ultimately, the demise of Arthur Andersen. A company that had a history of over 90 years had collapsed in less than a year. Similarly, exponentially spreading negative word-of-

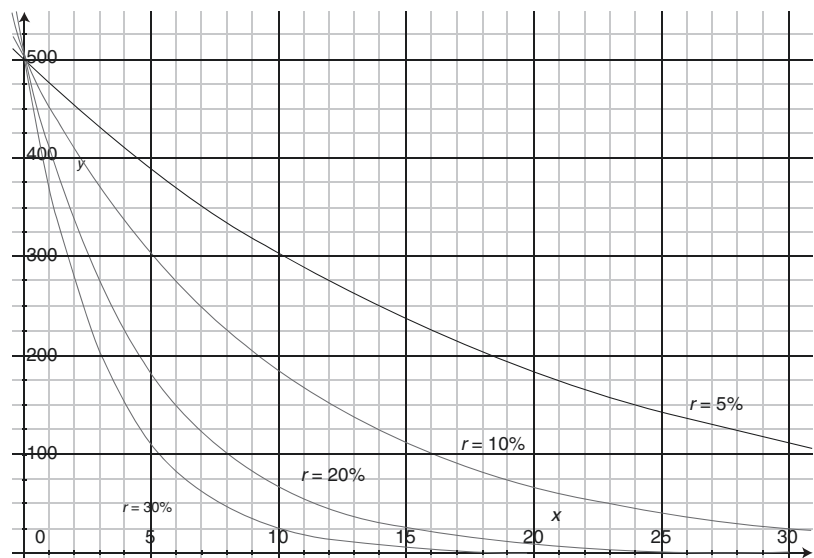
mouth, fuelled by unfavourable comparison with smartphones from Apple and Samsung, resulted in the precipitous erosion of Nokia and Research In Motion (RIM) brands.

The case of R&D capital eroding exponentially illustrates another mechanism. If the degree of protection conferred by patents and other legal mechanisms is determined exogenously, then firms with large or small capital stocks alike will be exposed to similar spillover threats (Levin et al. 1987). The absolute amount of the R&D leak (outflow) will therefore be a function of the size of the R&D capital stock, which gives rise to exponential decay: initially, outflows are large and get smaller when the stock is being depleted.

Figure 1 shows the decay of an asset stock of value 600 that erodes at different rates (from 5% to 30%). As can be seen, exponential decay curves are steepest initially (outflow reflecting the initially large stock value) and gradually flatten out over time. A good way to grasp how fast assets are eroded under exponential decay is the notion of *half-life*, the period of time over which the asset stock drops to half of its original level. It is calculated as $\ln 2/r$. Illustrative decay rates and corresponding half-lives are shown in Table 1. In the case of a 5% decay rate, the value of the R&D capital or brand will be halved only after 13.9 years. It would take another 13.9 years to



Dynamics of Resource Erosion, the, Fig. 1 Asset stock erosion (expressed in unit values) following an exponential decay for decay rates of 5%, 10%, 20% and 30% when inflows are halted



bring the value to a quarter of its original value. In contrast, a decay rate of 30% would halve the value in 2.3 years, and bring it to a quarter of the value in 4.6 years.

The key *strategic* implication of exponential decay – particularly when the proportional rate of decay r is high – is that it reduces the asymmetry between ‘haves and have-nots’. Without proportionally high inflows to maintain their level, large asset stocks are quickly reduced to small stocks: first they decline very rapidly and then linger on indefinitely at infinitesimal small levels.

Another way to illustrate the competitive implications of exponential decay is to compare the time required of a latecomer (B) to catch up to a first mover (A) under different decay rates. Firm A has an asset stock of 500 and makes investments to maintain it at this level. Firm B’s asset stock initially stands at 0 and B spends twice as

much as A to catch up. In Fig. 2, we compare the scenarios where the decay rate is low ($r = 4\%$) and where it is high ($r = 20\%$). When $r = 4\%$, it takes A 20 to maintain its asset stock; when $r = 20\%$, A’s required maintenance investment increases to 100 per period.

The equations of motion when B is spending at twice the rate of A, for $r = 4\%$ and for $r = 20\%$ respectively, are given by:

$$\frac{dS_B(t)}{dt} = 40 - 0.04S(t) \tag{5a}$$

$$\frac{dS_B(t)}{dt} = 200 - 0.2S(t). \tag{5b}$$

Solving these differential equations gives:

$$S_B(t) = 1000(1 - e^{-0.04t}) \tag{6a}$$

$$S_B(t) = 1000(1 - e^{-0.2t}). \tag{6b}$$

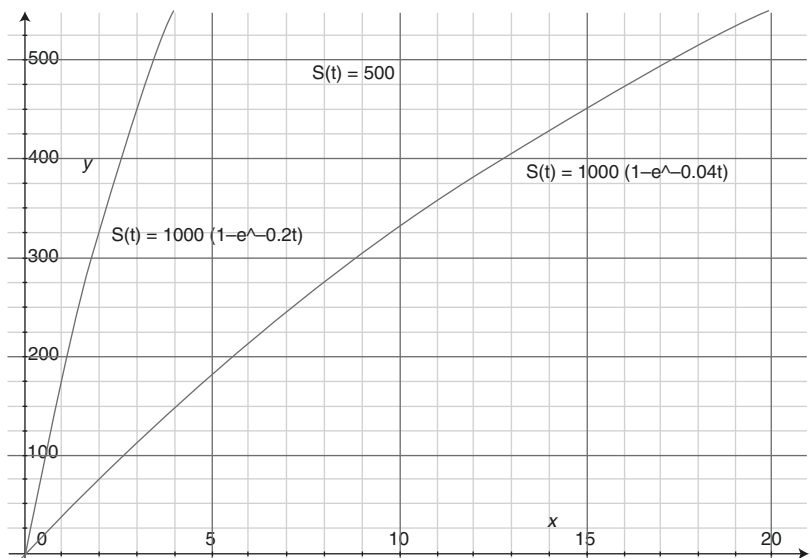
Equations 6a and 6b, which describe the accumulation trajectories of firm B in each of these two scenarios as well as the constant asset stock of firm A, are shown in Fig. 2.

It can be seen that in the first scenario, where the rate of exponential decay is low ($r = 4\%$), it takes firm B – who is spending at twice the rate of

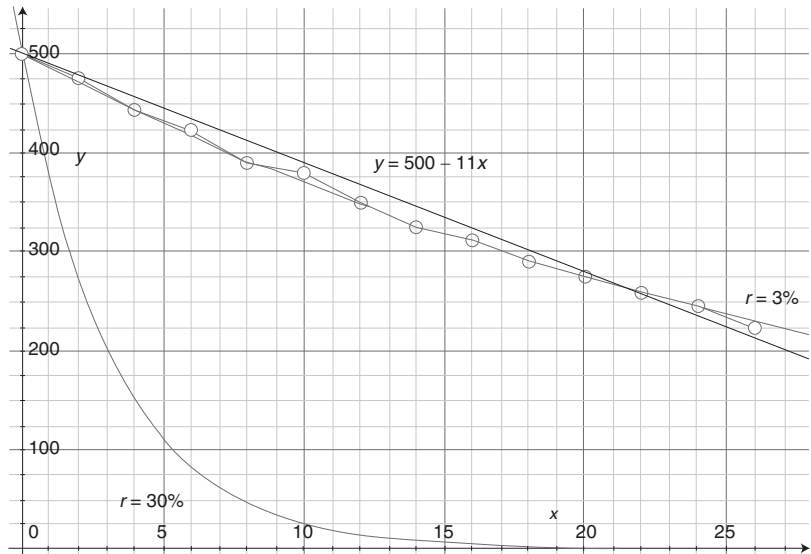
Dynamics of Resource Erosion, the, Table 1 Half-life for decay rates of 5%, 10%, 20% and 30%

| Decay rate | Half-life |
|------------|-----------|
| 5% | 13.9 |
| 10% | 6.9 |
| 20% | 3.5 |
| 30% | 2.3 |

Dynamics of Resource Erosion, the, Fig. 2 Catch-up spending: accumulation trajectories when firm B spends twice as much as A and exponential decay rates are 20% and 4%, respectively



Dynamics of Resource Erosion, the,
Fig. 3 Linear vs. exponential decay with low (3%) and high (30%) exponential decay rates



A – about 17.5 years to catch up with A. In contrast, when the exponential decay rate is high ($r = 20\%$), it only takes B 3.5 years to catch up! As this example shows, the strategic significance of high exponential decay rates is that they reduce the asymmetry between first movers and competitors who are trying to catch up.

When exponential decay rates are low, exponential decay can be closely approximated by linear decay – which, as we have seen, maintains asymmetries between asset stocks. As Fig. 3 shows, a linear specification provides about the same fit for the data as an exponential specification with a decay rate of 3%. Thus, for long-lived assets, it makes little difference whether we specify an exponential or a linear decay process. In both cases, the asymmetry between asset stocks is maintained. When asset erosion is important, the distinction between linear and exponential decay is critical, however, as high exponential decay rates quickly level initial asset asymmetries.

The Combined Effects of Growth and Decay

When an asset stock is subject to both exponential growth and exponential decay, it may evolve in a variety of ways. For example, firms sometimes

rush to market with new products that are not fully tested. These may be of sufficient quality to a majority of customers who share their positive experience with other customers, that is, they start a positive word-of-mouth effect. However, some customers may find the products unacceptable and voice their critique, creating a negative word-of-mouth effect. The resulting word-of-mouth stock is a composite of both processes.

Consider Apple’s latest hot product, the hypothetical ‘iPhone 13’. Some consumers appreciate its amazing new features (and spread positive news) while others are disappointed by the short battery life (and spread negative news). Of the initial 100 customers, 90% have a positive experience and 10% are dissatisfied. Let us further assume that negative news travels at three times the rate (0.30) as positive news (0.10). As a consequence of positive word-of-mouth effects (goodwill), new customers will be added to the customer base each year. However, some of these new customers will also be disappointed (say 10%) and thus will, along with the initial disgruntled customers, contribute to the development of ill will.

Figure 4 shows the net result of positive and negative word-of-mouth effects. An unsuspecting firm may think for quite some time that it is right on track. A vast majority of its customers is happy and the echoes that are picked up are largely positive: its word-of-mouth capital is growing



Dynamics of Resource Erosion, the, Fig. 4 The combined effect of exponential growth and decay



steadily. However, as the base of disgruntled customers continues to grow at twice the rate as the base of happy customers, negative word-of-mouth inevitably catches up. After that point, net word-of-mouth capital is drained at an astonishing rate, completely surprising the unsuspecting firm.

Other examples of this type of dynamic include *industry consolidation* efforts where a small number of ‘defectors’ derail the efforts of a much larger number of ‘cooperators’; *social networks*, such as MySpace, where the opinions or departure of a small number of mavens may tip the balance in one direction or another; or *stock markets* where both ‘bulls’ and ‘bears’ drive the sentiment around stocks. Finally, common resources (e.g., safety, environmental sustainability, innovation clusters), which often suffer from ‘the tragedy of the commons’ (overconsumption of and/or underinvestment in common resources) are other situations where opposing stock dynamics shape the direction of the common resource towards either sustainability or depletion.

‘Pipelines’ and Inference Lags

Sometimes it is possible to see how stocks decay. For example, engineers can now visualize the contents of oil reservoirs through sophisticated

seismic imaging techniques with a fairly high degree of accuracy. Quite often, however, assessing the value of asset stocks is complicated by the fact that many are *constructs that are not directly observable*. In this respect, resource stocks are like demand curves: they are useful constructs. They enable us to explain important real-world phenomena. But nobody has actually *seen* an asset stock such as ‘brand awareness’ or ‘R&D capital’.

The level of these asset stocks must be inferred from observable data. There are two ways to do this. First, we can construct the level of an asset stock from a history of measureable input flows (based on our assumptions about the equation of motion). Essentially, this is what accountants do when they capitalize certain expenditures: they book asset stocks on the balance sheet based on historical input flows and (usually rather crude) assumptions about the equation of motion. Alternatively, we may draw inferences from observing some output that is thought to be a good proxy for the unobservable asset stock. This is what managers usually do. For example, the level of (non-patented) proprietary know-how may be inferred from the number of new product features that the company is introducing.

The problem with the second approach is that changes in the unobservable asset stock often

manifest themselves in the observable proxy with a lag. Suppose a company maintains a constant stock of proprietary know-how. This know-how stock feeds a constant flow of ideas into a ‘development pipeline’, and it takes 4 years to develop a new product idea to the point where it can be brought to market. Then this pipeline – which is also a ‘stock’ – contains 4 years of new product ideas in various stages of development. Suppose now that this company abruptly halts all spending on research. What happens? The (unobservable) know-how stock starts to decline right away, resulting in fewer ideas being fed into the development pipeline. However, since ideas that are already in the pipeline continue to be developed, it takes 4 years before the R&D cut results in an observable drop in new product features.

This pipeline-induced lag is particularly important in industries such as the pharmaceutical industry, where the time to develop a new product idea into a marketable product is predictable, comprises a specific number of well-defined stages, and is *very* long. The various drug application hurdles (Investigational New Drug, New Drug Application, clinical trials) spaced out over a period of about 10 years give timely insight into competitors’ R&D capital stocks. In such industries, the lag effect is well understood by managers and industry observers alike. As a result, the pipeline *itself* is being closely watched – not just new products. However, in other industries, where development time is aleatory and where different stages of development are not as well defined (e.g., video game development, aircraft manufacturing), this lag effect may take management by surprise. Since dramatic spending cuts do not immediately translate into equally dramatic output drops, the effects of the asset erosion may go unnoticed. Perhaps it provides a justification for some to argue that they ‘overspent’ in the first place! However, when the effects become clear, it often takes enormous efforts and time to reverse the situation.

Conclusion

Asset erosion dynamics, along with asset mass efficiencies and time compression diseconomies,

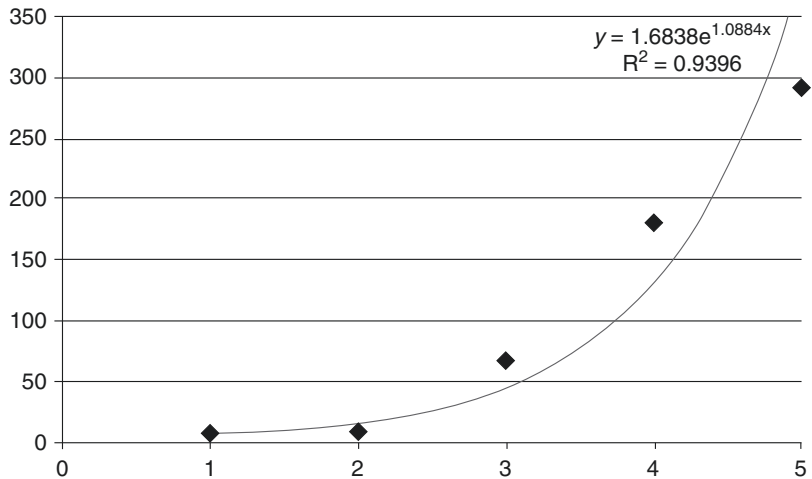
determine how long firms with higher asset stock levels can maintain a competitive advantage based on these higher asset levels. When asset decay follows a linear process, competitive asymmetry between two firms that face the same amount of asset erosion is maintained and therefore does not affect competitive advantage. Of course, when the decay rate is different, competitive position will be affected.

Linear erosion is a good approximation of what can be expected under exponential erosion with a low decay rate: catching up to firms with high asset stocks levels will be very time-consuming and expensive as the half-life of the stocks is very long. When asset decay rates are high, for example because knowledge cannot be easily protected, latecomers can catch up – and overtake – first movers much faster as the assets have inherently a shorter half-life. Not surprisingly, companies and countries that are late in industrializing tend not to be supporters of intellectual property rights.

When the exponential decay rate is high, firms that ‘know’ more should also expect to be ‘leaking’ more. They therefore need to take extra precautions to protect their asset stocks, increase their investments in their stocks, or do both. When there is such an investment ‘arms race’ between large competitors, smart imitators have much to gain. For example, in the tyre industry, latecomers such as Hankook have been able to benefit extensively from the R&D race between Michelin and Bridgestone, especially since in this industry R&D knowledge is hard to protect.

High exponential erosion rates of asset stocks should be taken as a warning signal by management. Leading firms should realize early on that the competitive playing field is being leveled very quickly, as critical asset stocks, such as proprietary knowledge in the case of Michelin and Bridgestone, are eroding rapidly. Yet, when stocks have a composite nature, for example in the case of reputation driven by word-of-mouth, the accumulation of positive word-of-mouth (exponential growth) and negative word of mouth (exponential decay) can hide the negative sentiment for a long time, until it overtakes the positive sentiment – and the reputation ‘suddenly’

Dynamics of Resource Erosion, the, Fig. 5 The number of clients leaving Arthur Andersen in the 5 months following its statement on 10 January 2002 that it had destroyed ‘a significant but undetermined number’ of Enron-related documents



collapses beyond repair. The spectacular collapse of Arthur Andersen may be referred to again. Long known as the standard setter for auditing independence, it had become increasingly aggressive during the 1980s and 1990s in growing its top and bottom lines by selling consulting and other services to its auditing clients (such as internal auditing to the same clients). Increasingly, this blurred the lines between independent auditing and selling lucrative services. Their association with the scandals at DeLorean, Waste Management, the Baptist Foundation of Arizona, Supercuts and other major clients had probably led to growing negative word-of-mouth, but this was hidden by the large stock of positive word-of-mouth stemming from its impeccable heritage and expanding client base. When the Enron scandal broke, highly visible blue-chip companies such as Merck, Abbott, Sara Lee and others jumped ship. Undaunted, Arthur Andersen proclaimed that the company’s 100,000 or so clients around the world were staying with them.

Defections continued to increase exponentially, however (Patsuris 2002). Figure 5 shows the number of defections per month (as well as an exponential fit) following Andersen’s statement on 10 January 2002 that it had destroyed Enron-related documents. In the 8 months to 15 August, it lost 832 clients – and \$1,399,334,185 in total billings. Unless this haemorrhage could be halted early on, ‘sudden’ collapse would become inevitable. Many accounts detail how the leadership at

Arthur Andersen failed to see how ‘the trickle of defections would turn into a torrent’ (McRoberts 2002, *Chicago Tribune*, 4 September 2002). Within a year the company was in tatters.

See Also

- ▶ [Asset Mass Efficiencies](#)
- ▶ [Competitive Advantage](#)
- ▶ [Complementary Asset](#)
- ▶ [First-Mover Advantage](#)
- ▶ [Resource-Based Theories](#)

References

- Amit, R., and P.J.H. Schoemaker. 1993. Strategic assets and organizational rent. *Strategic Management Journal* 14: 33–45.
- Barney, J. 1986. Strategic factor markets: Expectations, luck and business strategy. *Management Science* 32: 1231–1241.
- Barney, J., and D.N. Clark. 2007. *Resource-based theory: Creating and sustaining competitive advantage*. Oxford: Oxford University Press.
- Conner, K.R. 1991. A historical comparison of resource-based theory and five schools of thought within industrial organization economics: Do we have a new theory of the firm? *Journal of Management* 17: 121–154.
- Cool, K., L. Almeida Costa, and I. Dierickx. 2002. Constructing competitive advantage. In *Handbook of strategy and management*, ed. A. Pettigrew, H. Thomas, and R. Whittington. London: Sage.

- Dierickx, I., and K. Cool. 1989. Asset stock accumulation and sustainability of competitive advantage. *Management Science* 35: 1504–1511.
- Knott, A.M., D. Bryce, and H. Posen. 2003. On the strategic accumulation of intangible assets. *Organization Science* 14: 192–207.
- Levin, R.C., A.K. Klevorick, R.R. Nelson, S.G. Winter, R. Gilbert, and Z. Griliches. 1987. Appropriating the returns from industrial research and development. *Brookings Papers on Economic Activity* 3: 783–831.
- McRoberts, F. 2002. A final accounting: The fall of Arthur Andersen. *Chicago Tribune*, (series 1–4 Sept 2002).
- Pacheco de Almeida, G. 2010. Erosion, time compression and self-displacement of leaders in hypercompetitive environments. *Strategic Management Journal* 32: 1498–1526.
- Pacheco de Almeida, G., and P. Zemsky. 2007. The timing of resource development and sustainable competitive advantage. *Management Science* 53: 651–666.
- Patsuris, P. 2002. Andersen clients evacuate post-verdict. *Forbes*. Available at http://www.forbes.com/2002/03/13/0313andersen_print.html. Accessed 17 May 2013.
- Peteraf, M.A. 1993. The cornerstones of competitive advantage: A resource-based view. *Strategic Management Journal* 14: 179–191.
- Peteraf, M.A., and J. Barney. 2003. Unraveling the resource-based tangle. *Managerial and Decision Economics* 24: 309–323.
- Teece, D.J., G. Pisano, and A. Shuen. 1997. Dynamic capabilities and strategic management. *Strategic Management Journal* 18: 509–533.
- Wernerfelt, B. 1984. A resource-based view of the firm. *Strategic Management Journal* 5: 171–180.
- Wernerfelt, B. 2011. The use of resources in resource acquisition. *Journal of Management* 37: 1369–1373.