2

The Evolutionary Approach

In this chapter, we take up three issues. First, we define and explain the four generic processes that drive evolution and generate the critical events occurring in the life histories of organizational entities. The processes subsume other processes, such as mutation, recombination, random drift, learning, institutionalization, convergence, reorientation, entrepreneurship, cooperation, and competition. Second, we consider the utility of the evolutionary approach through an historical case study, examining the emergence of bureaucracy at Wedgwood Pottery in late 18th-century Britain. Finally, we review three key issues of research design that an evolutionary approach must consider, noting points of disagreement among theorists. These include selection biases that may affect a research design, the problem of defining novelty in routines, organizations, and organizational forms, and the choice of the units of analysis involved in an evolutionary process. Some theorists favor focusing on *activities and structures* on which evolution operates, such as routines, competencies, and jobs, whereas others favor *bounded entities* that carry activities and structures, such as groups, organizations, populations, and communities.

Evolutionary processes

Evolution results from the operation of four generic processes: variation, selection, retention, and the struggle over scarce resources (Campbell, 1969). They are listed in Table 2.1, along with definitions and examples. Evolutionary theory is not a set of deductively linked law-like statements (Sober, 1984). Instead, it is 'a concatenated system of loose, but apparently true and heuristic propositions … it poses interesting questions, provides clues to their solution and, perhaps most crucially, generates testable hypotheses' (Langton, 1984: 352). The four generic processes comprising evolutionary theory are necessary and sufficient to account for evolutionary change. If processes generating variation and retention are present in a system, and that system is subject to selection processes, evolution will occur. Most importantly, as Dennett (1995), Hull (2001), and others have noted, these mechanisms need not be restricted to the biological level. The principles we draw upon are generic ones, applicable to social as well as biological systems.

Table 2.1 Evolutionary processes

Evolutionary process	Definition	Example
Variation	Change from current routines and competencies; change in organizational forms • *Intentional*: occurs when people actively attempt to generate alternatives and seek solutions to problems • *Blind*: occurs independently of conscious planning	• Within organizations: problemistic search • Between organizations: founding of new organization by outsiders to an industry • Mistakes, misunderstandings, surprises, and idle curiosity
Selection	Differential elimination of certain types of variations • *External selection*: Forces external to an organization that affect its routines and competencies • *Internal selection*: Forces internal to an organization that affect its routines and competencies	• Market forces, competitive pressures, and conformity to institutionalized norms • Pressures toward stability and homogeneity, and the persistence of past selection criteria that are no longer relevant in a new environment
Retention	Selected variations are preserved, duplicated, or otherwise reproduced	• Within organizations: specialization and standardization of roles that limit discretion • Between organizations: institutionalization of practices in cultural beliefs and values
Struggle	Contest to obtain scarce resources because their supply is limited	• Struggle over capital or legitimacy

Beginning with Spencer (1898), scholars have been interested in social applications of evolutionary analysis. Darwin's variation-selection-retention model has attracted more and more adherents, as evolutionary theory has shed the taints of early misunderstandings, such as that 'evolution' implies 'progress.' However, the term 'evolution' still provokes negative emotional reactions from some social scientists. Many of them have been reluctant to consider the evolutionary approach because of misunderstandings caused by authors who confuse old-fashioned social Darwinist ideas with modern evolutionary ideas. For example, Giddens' (1985) portrayal of evolutionary principles was incomplete and slanted because he relied on authors with outmoded ideas, as Hodgson (1993: 41–42) pointed out. As evolutionary applications become more common, we expect such misunderstandings to diminish in frequency and intensity.

Over the past few decades, Boyd and Richerson (1985), Dawkins (1986), Dennett (1995), and Hull (2001) have provided lucid explanations of evolutionary thinking, and Nelson (1994) has applied evolutionary ideas to economic change. Many researchers have used evolutionary principles in their investigations. For example, McPherson invoked an explicitly Darwinian evolutionary model in a series of projects investigating the growth and decline of voluntary associations (McPherson, 1990; McPherson and Ranger-Moore, 1991; McPherson et al., 1992). Lomi and Larsen (1998) used computational models to analyze the dynamics of localized competition in organizational populations. Such empirical projects demonstrate the gains that follow from exploiting the natural affinity between evolutionary principles of explanation and a substantive focus on organizational- and population-level change.

Variation

Variation is a useful analytic starting point for understanding evolution. Any departure from routine or tradition is a variation, and variations may be intentional or blind. *Intentional variations* occur when people or organizations actively attempt to generate alternatives and seek solutions to problems. They result from conscious responses to difficult situations, planning sessions, advice from outside consultants, and so forth. *Blind variations*, by contrast, occur independently of conscious planning. They result not from intentional responses to adaptation pressures but rather from accidents, chance, luck, conflict, malfeasance, and so forth (Brunsson, 1985; March, 1981). Variations are the raw materials from which selection processes cull those that are most suitable, given the selection criteria. The higher the frequency of variations, whatever their source, the greater the opportunities for change.

Sociological theorists often pose the relative importance of intentional variations as the problem of *agency*: how much scope do people have for independence and creativity in the face of social structural constraints on their understanding and behavior (Emirbayer and Mische, 1998)? Agency is an important problem, but we need to separate the question of whether actors are free to take autonomous action from the question of whether their actions – from whatever intentions – are consequential. By 'consequential' we mean that the world actually changes because of an actor's behavior. Of course, some actors enjoy greater access to wealth, power, and prestige than others, and their actions thus have a greater likelihood of succeeding than those of less privileged actors. The evolutionary approach separates the issue of the conditions under which variations are produced from the issue of the conditions under which they are selected and retained.

Evolutionary theory posits that a great deal of sociocultural variation is blind with respect to individuals' or organizations' needs. People's needs may well explain their reasons for generating variations as they engage in search behavior, trying to solve problems, but 'need' does not explain the solution. Blind variations can be as effective as deliberate ones. Selection of variations follows from their consequences, not from the intentions of those who generated the variations (Langton, 1979).

Variation within organizations

Sources of *intentional variation* within organizations include: (1) formal programs of experimentation and imitation; (2) direct and indirect incentives offered to employees; and (3) encouragement of unfocused variation or 'playfulness' (Miner, 1994). Organizations often attempt to induce exploratory variation by institutionalizing experimentation in

projects, programs, divisions, and other officially sanctioned activities (Burgelman, 1983). For example, the six computer industry firms examined by Brown and Eisenhardt (1997) relied on a variety of low-cost probes into the future, including experimental products and strategic alliances. Sitkin (1992: 239) argued that innovative organizations should design systems for promoting intelligent failure as a method of constructive experimentation: 'Failure can induce experimentation that, in turn, leads to increased variation in organizational response repertoires.' Variation may also be introduced as individuals and groups improvise in dealing with unforeseen circumstances, working under pressures not permitting lengthy contemplation of alternatives (Moorman and Miner, 1998).

Incentives for variation from standard routines include making *innovation* part of employees' job descriptions, financially compensating workers whose ideas are selected for further evaluation, and creating competitions between work groups with recognition as a symbolic reward. Planned transfer of people across units diffuses knowledge about new practices throughout an organization. Miner (1994) argued that some organizations tolerate occasional unfocused variations as the cost of keeping creative but slightly eccentric employees. Managers sometimes also encourage unfocused variations because they recognize that induced variations are often not radical enough to break through to new ground. Such policies are important because they help generate and sustain organizational heterogeneity that would otherwise disappear because of pressures to conform.

Variations are also sometimes deliberately suppressed within organizations. Dominant groups and coalitions may constrain opportunities for variation to prevent challenges to their power and privilege (Pfeffer and Salancik, 1978). Powerful groups may create unobtrusive structures and promote interpretive principles that shape people's perceptions of what is necessary and possible (Burns and Dietz, 1992; Perrow, 1986). For example, in her study of the Dow and DuPont Chemical companies, Draper (1991) documented how company doctors defined occupationally induced hazards as a problem of unique, individual susceptibility and withheld information from workers. Had they defined the problems as due to workplace arrangements and practices, knowledgeable workers might have switched jobs or taken collective action to demand better protection from the hazards. Instead, workers sought outside medical attention or simply lived with their disabilities.

Sources of *blind variation* in organizations include: (1) the everyday variation generated by members fulfilling their roles as organizational participants, involving trial and error learning, luck, imitation, mistakes, passion, misunderstandings, idle curiosity; and (2) member reactions to unexpected environmental 'jolts' (Meyer, 1982) such as membership turnover, labor strikes, financial crises, legal scandals, and the like. Variations may occur in an organization's jobs, as workers forget standard routines, invent new ones, hear gossip about better practices, drop or unplug things, pursue creative insights, and become discouraged or bored. Variations can also occur in work groups, especially those involving demographic changes (Lawrence, 1997). Variations crop up as new members are included, old ones are fired or laid off, tasks are transferred, and members come to like each other more.

At the department and upper management levels within organizations, variations include a mix of deliberate and blind actions. New managers try to look good by reorganizing things, and research and development labs create products for which markets must be found. They also include marketing departments selling products

that organizations have not yet found a way to build, and newly minted MBAs discovering that everything in their organization needs to be re-invented. Blind variations may also be interjected when other organizations are imitated. When managers of California savings and loan institutions were searching for models to follow in their diversification efforts in the 1980s, they ignored similar organizations and imitated successful organizations larger than themselves (Haveman, 1993c). By trying to copy from dissimilar organizations, rather than their peers, they increased the likelihood of unintentionally introducing discordant elements into their structures.

What is the relative mix of purposeful and blind variations? Corning (1974) argued that most variations within organizations are purposeful. Indeed, we have many accounts of managers behaving in very sensible and deliberate ways (Mintzberg, 1974). Managers, almost by definition, believe that most of what they do is *not* blind; they assume that they can use their skills, when faced with uncertainty and risk, to improve their situations (March and Shapira, 1987). In contrast to the many hopeful views of purposeful variation, other theorists have not been so sanguine. Kaufman (1985: 54) listed the challenges facing managers in uncertain environments, including reconciling differences of opinion, coping with irrationality in decision processes, and struggling with imperfect attempts to implement decisions. His conclusion was that 'a successful response to an environmental challenge can be a very fortuitous thing.' Campbell (1982, 1994) held the belief – shared by Weick (1979) – that most variations are blind. Nelson and Winter (1982: 11) argued for a mixed position: 'it is neither difficult nor implausible to develop models of firm behavior that interweave 'blind' and 'deliberate' processes. Indeed, both elements are involved in human problem solving itself and are difficult to disentangle.'

Organization- and population-level variation

A crucial feature of an evolutionary framework is that it must consider not only variations *within* existing organizations but also variations introduced by *new* organizations or *new* organizational populations. Variations are potentially introduced into populations and communities whenever new organizations are founded. Intentions play a pivotal role in the goal-directed activities involved in organizational foundings, as we point out in Chapter 4. Most founders apparently intend to reproduce the characteristics of organizations perceived as successful. They thus avoid departures from the norm in their population. Nonetheless, mistakes in copying are frequent, haphazardly introducing blind variation into new organizations. Although failures and errors can be fruitful because they stimulate further variation (Sitkin, 1992), many prove fatal.

Some foundings are deliberately undertaken as departures from established organizational forms. If successful, such radical innovations transform the conditions of existence for other organizations by destroying the competencies on which they are based (Tushman and Anderson, 1986). Examples include the development of new product classes, such as automobiles replacing horse-drawn wagons (Lawrence and Dyer, 1983), or close substitutes for existing products, such as diesel for steam locomotives (Marx, 1976). In Chapter 9, we examine the conditions facilitating foundings that are so radical that they generate entirely new organizational populations.

Naturally, variations at the population level may also be discouraged by organizations with a vested interest in existing arrangements. In their history of the radio broadcasting industry, Leblebici et al. (1991: 358) found that outsiders to the system introduced most new practices. Innovations were initiated by 'shady traders, small

independent stations, renegade record producers, weaker networks, or enterprising advertising agencies. The powerful parties who had vested interests in the institutionalized conventions used their resources to maintain the status quo or introduced practices that confirmed established conventions.' Many of the variations pioneered by outsiders were eventually adopted by dominant organizations, and others triggered legislative and regulatory responses that reshaped the industry.

Selection

Forces that differentially select or selectively eliminate certain types of variations generate a second essential evolutionary process: *selection*. Some variations help organizations acquire resources or legitimacy and are thus selected. Selection criteria are set through the operation of market forces, competitive pressures, the logic of internal organizational structuring, conformity to institutionalized norms, and other forces. If selection criteria favor administrative rationality and formalized control structures within an industry, then adaptive organizations will switch to the new practices. Bureaucratically structured organizations will survive at the expense of non-bureaucratic organizations. For example, during World War II, several forces accelerated the trend toward bureaucratic personnel practices. In a wide range of industries, three factors favored bureaucratization: (1) governmental intervention in labor markets, (2) growing union pressures, and (3) the increasing influence of professional personnel specialists (Baron et al., 1986; Baron et al., 1988).

Selection within organizations

Within organizations and work groups, internal diffusion, imitation, promotion, and incentive systems may be selective in ways that enhance fitness, decrease it, or are simply irrelevant. Scholars of strategic choice argue that managers can often introduce positive internal selectors, first by establishing the strategic direction of an organization and then by favoring elements of organizational design that are consistent with the logic, scope, goals, and competitive advantage of that strategy (Saloner et al., 2001). Others offer less omniscient portraits of organizational leaders, noting that positive selection is often introduced in a mode of 'firefighting' (i.e. reacting to current problems) rather than strategic planning (Mintzberg, 1974).

Management and business strategy writers usually focus on selection systems that improve fitness, whereas an evolutionary approach alerts us to the possibility that many selection systems are irrelevant or not tightly connected to environmental fitness. These systems preserve organizational diversity that is not tied to current environmental conditions. Organizations that are somewhat protected from their environments may even move *away* from external relevance, as in so-called 'ossified' or 'permanently failing' organizations (Meyer and Zucker, 1989). Three types of internal selectors contribute to the loose coupling of internal selection and environmental fitness: (1) pressures toward stability and homogeneity (Campbell, 1969); (2) the persistence of past selection criteria that are no longer relevant in a new environment (Campbell, 1994); and (3) the willingness of some organizational founders and leaders to accept a low performance threshold (Gimeno et al., 1997).

First, pressures in work groups and organizations often encourage internal stability and cohesion. Frequent interaction between members leads to positive reinforcement of interpersonal behavior that is rewarding for the people involved, and to the

elimination of incompatible behavior (Kanter, 1977). Such shifts in choices or attitudes within a group have been explained from a number of social psychological perspectives, including social comparison, self-categorization, and network influence theories (Friedkin, 1999). Interdepartmental and other intra-organizational activities are similarly influenced towards maintaining consistency, independently of external environmental pressures.

Second, internal selection criteria may continue as vicarious representatives of past external criteria. Procedures that were once selected because they fit the context may be irrelevant or even maladaptive to the current situation. As an organization repeats the practices, members become proficient at reproducing them day after day and thus are more likely to continue using them. The self-reinforcing process contributes to organizational stability, but can also lead to *competency traps* that inhibit the discovery of potentially adaptive alternatives (Levitt and March, 1988). Members may simply continue doing what they know best, rather than search for more effective options.

Third, investments in human capital specific to a particular organization, psychic income from association with the organization, and the costs of switching to another activity make some founders and leaders less sensitive to low organizational performance than others. Founders and leaders may become attached to an organization for what it represents, rather than for what it accomplishes. They may also perceive that their skills are more valuable inside the organization than elsewhere. For example, Gimeno et al. (1997) followed 1,547 firms over three waves of data collection from 1985 to 1987. They examined the determinants of firm performance and decisions to discontinue the firm, and found that owners differed in the threshold of performance they were willing to accept. Owners who were more intrinsically motivated and had a family history of business ownership were 'more likely to accept a lower level of economic performance to remain in business' (Gimeno et al., 1997: 771). They also found that older owners had a lower threshold of performance than younger ones and were willing to remain in business despite low returns.

Organization- and population-level selection

Organizations exhibiting maladaptive variations in technology, managerial incompetence, non-conforming norms, or other problematic acts are likely to draw fewer resources from their environments and therefore are more likely to decline in performance. For example, in 2000–2001 over 679,000 business establishments were discontinued in the United States (Small Business Administration, 2004). Over time, populations are more apt to be characterized by the attributes of surviving organizations than by the attributes of those that disbanded. However, the speed of this change will depend on the founding rates of organizations with other attributes, as well as on individual differences in sensitivity to selection pressures, as we noted above.

Strong selection pressures explain the high degree of similarity in the psychological profiles and business operating practices of men and women owners, and ethnic minority and non-minority owners, within small business sectors. Competition from similar businesses leads to similar opening hours, credit practices, and staffing patterns, particularly use of family labor. For example, regardless of their ethnicity, business owners in English inner cities in the early 1980s tended to employ their children, to compensate for their inability to hire regular employees (Zimmer and Aldrich, 1987).

At the population level, consistent selection criteria may drive organizations toward a standard set of routines. Under the requirements of Title IX of the Education

Amendments of 1972 enacted by the U.S. Congress, colleges and universities in the United States have moved toward equalizing the amount of money that they spend on men's and women's sports. In addition to governmental pressures, colleges and universities were under growing pressure in the 1990s from the National Collegiate Athletic Association (NCAA), the private non-profit organization regulating college sports. The NCAA laid down procedures regulating student recruitment, the number of coaches allowed in a sport, practice schedules, and so forth. Thus, in an example of population-level selection forces, the athletic programs of major universities began converging on a similar set of practices, without regard to a particular college or university's local history.

Variations that culminate in *collective action* within a population can blunt or enhance the impact of selection pressures. For example, individual firms in an industry's early days may succeed in forming an employer's association to deal with workers' wage demands. The employer's association can standardize costs across the industry (Staber and Aldrich, 1983). As long as the employer's association monitors and enforces any agreements reached, wages in the ensuing period are a constant for all organizations in the population. Consequently, wage differences across firms will not be a source of selection pressures.

Collective action can create *cooperative alliances* between populations of producers, suppliers, and distributors that transform a formerly competitive community into a set of mutually interdependent populations. In the Prato textile-producing region of Italy, pressures toward shorter product cycles led to the vertical disintegration of hundreds of firms and resulted in a flourishing population of thousands of new firms. New ventures were launched by foremen and mechanics, and the focus of production shifted from large integrated firms to constellations of many smaller firms, led by a primary firm (Lorenzoni and Ornati, 1988). Collective action persists in such cases only if institutionalized, and the barriers to it are formidable (Moe, 1980; Olson, 1965; but see DeNardo, 1985).

Retention

A third evolutionary process involves the operation of a *retention* mechanism for the maintenance of positively selected variations. Retention occurs when variations are preserved, duplicated, or otherwise reproduced so that the selected activities are repeated on future occasions or the selected structures appear again in future generations. Retention processes allow groups and organizations to capture value from existing routines that have proved – or been perceived as – beneficial (Miner, 1994: 85). When environments change slowly, replication of selected variations is the key to continuity in organizational existence. Without the constraints on variation provided by retention mechanisms, gains from selected variations would rapidly dissipate.

Retention within organizations

Stability in the structure and activities of individual organizations is a central focus of traditional organizational analysis, and management textbooks are filled with techniques for the perpetuation of a specific organizational form. Smircich (1983: 341), following Meadows (1967), argued that organization theory is 'dominated by the concern for the problem of social order.' Documents and files are the material embodiment of past practices and are handy references for persons seeking appropriate

procedures to follow. For example, accounting and information management systems create categories that channel and document certain activities, directing members' attention toward them and away from undocumented activities (Walsh and Ungson, 1991). Organizational memory also inheres in physical resources such as buildings and machines (Latour, 1993).

Retention within organizations is greatly facilitated by humans' inherent abilities to acquire habits. As Hodgson (2004a) pointed out, an ability to learn valuable behaviors so thoroughly that they become automatic gives humans a great advantage in routine situations. Habits can be contrasted with instincts, which are wired into humans. Instincts represent fundamental drives that shape the environment in which habits are learned, but cannot themselves become the basis for a full-fledged repertoire of responses. Were humans totally dependent on instincts, they would be helpless in complex and rapidly changing situations they had not encountered before. Habits, such as standard ways of solving problems constituting threats to survival, help people economize on information processing and interpretation. Habits allow people to draw on habitual dispositions, thus reducing their cognitive loads so they can attend to the unique aspects of new situations.

Specialization and standardization of roles limit members' discretion and buffer organizations against unauthorized variation from official policies. However, loose coupling within organizations creates opportunities for deviance that are sometimes hard to root out. Members may over-generalize from official tolerance for some kinds of deviance and infer that other sorts will also be tolerated. Centralization of authority and formalization of duties also limit role discretion, channeling members' activities in ways that make them more accountable to higher authorities. Selected routines, structures, and procedures thus help preserve existing organizational forms, if organizations continue to fit the relevant selection criteria.

Organization- and population-level retention

At the population level, retention preserves the technological and managerial competence that all organizations use, collectively, to exploit the resources of their environments. For example, the survival of a particular type of personal computer firm is not terribly consequential to the survival of its population. The entire population's survival depends on the total pool of technological and managerial competencies held by all personal computer firms. Thus, when the Osborne Computer Company, a pioneering firm, went bankrupt in the early 1980s, its employees and customers simply switched to other firms in the population. Variations possessed by particular firms contribute to the total pool but do not determine its collective fate. Of course, a single firm might *develop* an innovation that enhances a population's survival chances, but that would depend on the diffusion of the innovation throughout a large sector of the population.

Retained variations are passed, with more or less additional variation, from surviving organizations to those that follow, and from old to new founders, employees, and managers. Replication occurs via people observing one another, through training and education, learning appropriate rules of behavior, and interacting with machines and documents. Linkages between organizations facilitate the *diffusion* of variations, whereas isolated organizations contribute little or nothing to future generations. The movement of people between organizations facilitates knowledge diffusion (Phillips, 2002), as do alliances, consortia, and other strong ties (Strang and Soule, 1998). For example, Burns and Wholey (1993) found that cooperative interorganizational relations

between hospitals increased the likelihood of their adopting a matrix organizational structure when others in their region did so.

Diffusion of variations across organizations may be limited, however, because of factors that inhibit interorganizational learning. Diffusion of many innovations may be blocked by impermeable organizational boundaries. Organizations often cling to traditional ways or display a reluctance to trust outside information. Decisions on *which* variations to copy are clouded by ambiguity in outcomes observed from a distance (Abrahamson, 1991). Tacit knowledge embedded in an organization's routines may mislead outsiders into imitating the wrong variations. Finally, unforeseen circumstances such as hostility, mistakes, incompetence, and an unwillingness to learn also impede diffusion. Accordingly, not all variations are diffused to new organizations, introducing a large element of uncertainty into the process.

Knowledge of previously successful forms is institutionalized in the socialization apparatus of societies – schools, families, churches, public agencies – and in cultural beliefs and values defended by dominant organizations and institutions. With industrialization, there has been a trend toward the externalization and rationalization of culture. Oral traditions are now less important than the material artifacts of societies, such as written records, machines, and general capital improvements. Technological change, especially in the form of information transmission and retrieval systems, has vastly simplified the task of preserving administrative knowledge (Zuboff, 1988; Cortada, 1993).

Social stability and its effects on retention are seen most clearly in the role the state plays in the creation and maintenance of organizations. As the major constraint on organizational formation and persistence, the state's role appears in many guises: political stability and ideological legitimation, educational systems, improvements in transportation and communication networks, national economic planning, and other state investments. These forces affect the terms on which resources are made available to organizations. For example, state-supported school systems not only help maintain continuity in knowledge between generations by producing educated students, but also certify graduates as amenable to the disciplined regimen sought by potential employers (Collins, 1979). Institutions such as calculable law, an independent judiciary, and state-insured banks raise the probability that organizational forms, if successful, will persist and that unimaginative entrepreneurs will be able to copy them (Stinchcombe, 1965; Collins, 1997).

Struggle

Underlying selection pressures and the search for effective variations lies the scarcity of resources within organizations, between organizations, and between populations. Struggle occurs within organizations, as members pursue individual incentives as well as organizational goals. As we discuss in Chapter 6, some theories view an organization as a unified whole with a personality and goals of its own. Others focus on organizations as collections of individuals. Individualistic approaches view 'the emergence of organizations, their structure of roles, division of labor, and distribution of power, as well as their maintenance, change, and dissolution … as outcomes of the complex exchanges between individuals pursuing a diversity of goals' (Georgiou, 1973: 308). Barnard (1938) took this position in his influential portrait of organizations as incentive distributing devices. In these views, a scarcity of the things people value creates a need for organizational control systems and mechanisms for distributing incentives.

Organizations pursue many scarce resources, including time. Peoples' free time is limited in industrialized societies, and organizations want their share of it. Employing organizations, voluntary associations, work groups, and other entities often want the full commitment of members, but they cannot obtain it because members would then accomplish nothing else in their lives. Employers come closer to realizing this ideal than voluntary associations. *Greedy institutions* (Coser, 1974) want more, and must fight members' families and friends for them. In the United States, some organizations cope by expanding their hours and operating seven days a week. Voluntary associations routinely do this, but many businesses do, as well. All-night supermarkets, gas stations, restaurants, and convenience stores have 'colonized the night' (Melbin, 1987) as a way of expanding their domains without adding to fixed investments.

Most attempts to found new organizations fail and many organizations disband within a few years, as we note in Chapter 4. In a world of limited resources, only some organizations can obtain the land, labor, capital, and other things they need to survive. In Chapter 7, we point out that most organizations do not grow and that most very large organizations are a result of mergers and acquisitions, not internal growth. Even long-lived organizations remain vulnerable to environmental change, as shown by turnover on lists such as the Fortune 500.

Struggle also occurs between populations. When a particular type of organization proliferates, a struggle over resources and opportunities occurs, fueling the selection process between that population and other populations. Sometimes organizational populations expand rapidly because opportunities are diverse and resources abundant. As populations evolve, however, or resources become scarce, competition over resources increases mortality rates and lowers founding rates. Cooperative schemes that protect populations may arise, buffering some against resource scarcity. For example, ties to important community and state institutions may serve as a transformational shield by providing extra resources and legitimacy to some populations (Miner et al., 1990). However, complex cross-unit cooperative arrangements, such as coalitions, cartels, and many forms of interorganizational alliances, are highly vulnerable to short-term deviations. Members of such arrangements are under heavy pressure to make their own unique adaptations to local conditions.

Summary

Using these four principles, evolutionary theory explains how particular forms of organizations come to exist in specific kinds of environments. Variation, selection, retention, and struggle occur simultaneously rather than sequentially. Analytically, the processes may be separated into discrete phases, but in practice they are linked in continuous feedback loops and cycles. Variation generates the raw materials for selection, by environmental or internal criteria; retention processes preserve the selected variation. But retention processes also restrict the kinds of variations that may occur, and competitive struggles as well as cooperative alliances may change the shape of selection criteria. The process is not necessarily historically efficient, as March (1994) pointed out. Using a computer simulation with plausible parameter settings, Carroll and Harrison (1994: 720) showed that 'path-dependent processes can often generate outcomes other than those implied by historical efficiency.' Thus, the organizations and populations we observe at a given moment are not the 'most fit' in any absolute

sense. Rather, their forms reflect the historical path laid down by a meandering drift of accumulated and selectively retained variations.

Research Illustration 2.1 The Evolution of Bureaucracy

John Langton's (1984) analysis of Wedgwood Pottery provides a useful illustration of an evolutionary perspective using a case study methodology. Wedgwood is a British organization that was founded in the 18th century on the basis of Josiah Wedgwood's (1730–1795) extensive experimentation with ceramics, glazes, and colors. The firm still exists today, perhaps best-known for Wedgwood's innovative development of Queen's Ware, a cream-colored china, and Jasper Ware. Using an evolutionary perspective and detailed historical data, Langton sought to explain the emergence of bureaucracy at the pottery factory between its founding in 1759 and Wedgwood's death, as well as the subsequent bureaucratization of the British pottery industry.

The case study built on Weber (1978), who argued that authority systems would tend to evolve from charismatic and traditional forms to legal-rational forms, but did not provide a theoretically-motivated explanation for how this evolution occurs. Langton suggested that a variation-selection-retention (VSR) framework can readily provide this explanation. Josiah Wedgwood began with a number of *intended variations* at his factory, including the modification of work routines that would allow the mass production of superior but affordable pottery. He committed himself to an early version of scientific management, seeking to 'make such machines of the men as cannot err' (McKendrick, 1961: 34). *Blind variations* at the potbank deviated from Wedgwood's intentions, including such typical craftsman practices as drinking on the job, working flexible hours, taking Mondays off, and disregarding inefficiency or waste.

A variety of selection pressures, both those internal to the pottery factory and those affecting the pottery industry as a whole, favored the new work ethic advanced by Wedgwood. With respect to *internal selection*, Wedgwood replaced rules of thumb by rationalized administrative practices borrowed from his friend in London, Matthew Boulton. He also changed the way workers were hired and trained, and implemented a wide array of positive and negative sanctions within his factory. In many respects, however, *external selection* pressures – which favored the survival of the pottery factory itself – were even more significant. On the demand side, a rising standard of living throughout the 18th century changed British consumption patterns. The growth of coffee and tea drinking created an increased demand for earthenware, and traditional pottery manufacturers were unable to keep up. Improvements in transportation and communication, such as canals and paved roads, made long-distance movement of goods safer and cheaper. The labor force was also changing, as the Enclosure Movement forced many peasants off the land, thus making them available for wage labor. John Wesley, a Methodist preacher and a powerful public speaker, convinced workers to give up their traditional ways and turn more of their energies to work and the prospects of salvation. Wedgwood took advantage of these changes by creating a pottery factory that departed substantially from the organizational practices of traditional firms in the industry.

Wedgwood's innovations would have been short-lived if they had not become institutionalized at the pottery factory. The process of *retention* occurred through the creation of several permanent features of bureaucracy. As opposed to the artisan standard of autonomous craftsmanship, clear job descriptions and rules were introduced. The simple guild-like organization of the traditional potbank involved a two-tiered master–worker relationship that relied strongly on nepotism. By 1775, it was

replaced by a more complex hierarchical career structure, with advancement based on job performance. Whereas production at the traditional potbank was unreliable, the Wedgwood factory came to be regulated by documented routines and systems for book-keeping.

In keeping with an evolutionary point of view, Langton's argument suggests that the outcome at the pottery factory ultimately depended on the interaction between Wedgwood's actions and the context of the times. Wedgwood's pottery factory was selected because it produced superior products more cheaply than his competitors, given the resources available in that era. The success of Wedgwood's innovations eventually led to a new commercial pottery industry that displaced the older, cottage-based population.

While provocative, the argument also highlights some difficulties in Langton's research design. Like any case study, the examination of Wedgwood Pottery raises the question of *generalizability*: elements of the VSR framework here reflect the idiosyncratic context of an 18th century pottery factory. How can these be generalized to help account for the emergence of bureaucracy in other contexts? Langton (1984: 346–349) himself anticipated these concerns, implying that the inclusion of criteria drawn from other theories can help flesh out an evolutionary account. For example, mainstream economists may argue that Wedgwood's bureaucracy faced favorable selection because it minimized transaction costs (Williamson, 1994), while Marxists will suggest that it maximized control of the work process and allowed the exploitation of workers. In Chapter 3, we consider in greater detail how other organizational paradigms can be mapped to an evolutionary framework along these lines.

Research design in evolutionary analysis

Like any principled social scientific analysis, an evolutionary perspective requires that organizational theorists think carefully about three research design questions. These questions are not narrowly methodological but rather raise basic theoretical questions. First, what is the most appropriate *unit of analysis*: routines and competencies; work groups, divisions, and organizations; or populations and communities? Second, given the importance of emergence as an outcome in evolutionary analysis (see Chapter 1), how can we best define when routines, organizations, or organizational forms are *novel* in character? Third, given evolutionary theory's emphasis on an accurate portrayal of selection mechanisms, how can we ensure that our research designs do not impose *selection biases* themselves, thus obscuring basic evolutionary processes?

Units of analysis

Three possible units of analysis have been proposed: (1) routines and competencies within organizations; (2) organizations as a whole; and (3) entire organizational populations or communities. In one version of the first view, organizational learning theorists have also suggested focusing on *bundles* of routines and competencies, rather than taking them one at a time. In contrast, proponents of the second view tend to treat an entire organization as a single interconnected bundle. Some theorists have also proposed populations and communities as units of analysis. In the eclectic spirit of Hodgson and Knudsen (2004), who advocated multiple levels of analysis, we review the options without offering a strong recommendation for any specific perspective.

Routines and competencies as units of analysis

Three interpretations of the term 'routine' have been proposed: routines as behavioral regularities, cognitive regularities, and propensities (Becker, 2004). First, many analysts use the term to indicate recurrent patterns of interaction between members, emphasizing the collective and observable nature of routines (Nelson and Winter, 1982). Second, others treat routines as cognitive regularities, such as rules and standard operating procedures that members follow when they work and interact (March and Simon, 1958). Third, in a departure from the first two uses, Hodgson and Knudsen (2004) depicted routines as propensities that can trigger behavioral and cognitive regularities, thus emphasizing their probabilistic nature. This conception of routines as stored capabilities, rather than directly observable regularities, greatly complicates research. Nevertheless, it allows us to avoid an essentialist notion of routines as either 'all or nothing' patterns sustaining organizational activities. Although we favor the 'propensities' interpretation, most of the research we cite in this book follows one of the other two interpretations. It would be premature to settle on one interpretation, given the diversity of opinions and the growing number of contributions to this issue, e.g. Feldman and Pentland (2003).

Theorists examining evolution inside organizations have focused on the differential survival of strategic initiatives (Burgelman and Mittman, 1994), job roles (Miner, 1991), and administrative rules (March et al., 2000). They view organizations as composed of a mix of routines and competencies that can vary somewhat independently of one another and are thus available for selective retention. From this perspective, evolutionary processes affect the course of change – at whatever level – by their selective effects on the entities embodying routines and competencies. Organizations, then, are the temporary repositories of competencies and routines that are held by their members and embedded in their technologies, material artifacts, and other structures. The distribution of these competencies and routines in a population depends on the selective survival and growth of organizations that contain different combinations of them. Analysis should therefore focus on conditions favoring the selection of routines and competencies, with organizational survival a secondary consideration.

Using this view of organizations and populations, McKelvey (1982) proposed an ambitious scheme for classifying organizational forms. He defined organizational species as 'polythetic groups of competence-sharing populations isolated from each other because their dominant competencies are not easily learned or transmitted' (McKelvey, 1982: 192). A polythetic group is one where: (1) each member possesses many properties, p, of a set of properties, P, (2) each p in P is possessed by many members, and (3) no p in P, is possessed by all members (McKelvey and Aldrich, 1983: 109).

McKelvey proposed his definition as a way of avoiding the grouping idea underlying traditional conceptions of organizational form, in which all the members of a population possess the same set of properties and the classification scheme focuses on the average in a population. Contemporary accounts of organizational forms tend to be more flexible, although formal definitions continue to rely on a minimal common identity that is shared across organizations and is enforced by an external audience (Pólos et al., 2002).

Routines and competencies may be *bundled* into complementary sets and even tightly coupled at the organizational level. If so, then these bundles drive the fates of the organizations that carry them, rather than routines and competencies taken in isolation (Levinthal, 1991). The effect of individual features of a system may depend upon the

presence of other features, a condition called *epistasis* (Miner and Mezias, 1996: 93). To the degree that certain routines and competencies complement one another, selection will depend on whether entire sets are present in an organization.

Organizations as units of analysis

A second line of inquiry, pursued primarily by population ecologists but also by other theorists, treats organized entities as units of analysis, rather than the routines and competencies within the entities. To be a unit of selection, an entity must have the characteristics of a bounded system and have boundary-maintaining processes organized around the persistence of the unit and the perpetuation of its activities. Work groups, departments, divisions, organizations, and populations have this character, although in varying degrees.

Population ecologists, in particular, have focused on organizations as the units selected via an evolutionary process. They posit that changes in populations occur through the selective elimination of certain organizations and the survival of others. Even within this perspective, the choice of units of analysis can vary widely, ranging from establishments – physical sites occupied by an organization – to conglomerates – involving legally separate, but highly interdependent, organizations (Carroll and Hannan, 2000). Most analysts have avoided the extremes in this respect, emphasizing organizations as legally- and socially-defined entities, rather than physical locations or conglomerate groups.

Evolutionary ideas have also been applied to the emergence and decline of entire populations (Aldrich and Fiol, 1994; Renzulli, 2005; Ruef, 2000, 2004). Hannan and Carroll (1995: 29) argued that some forces affecting the organizational world can only be seen at the population level, and they defined organizational populations as 'specific time-and-space instances of organizational forms.' Thus, a population is identified not only by a generic label, such as 'public bureaucracy,' but also by the historical period and society in which it exists. Consequently, an ecological researcher would identify a subject of inquiry as 'the set of public bureaucracies in Japan between 1946 and 1993.' We examine the conditions promoting the emergence of new populations in Chapter 9.

Baum and Singh (1994a) advocated adding organizational communities to the list of bounded entities that can be selected, but other theorists have disagreed (Campbell, 1994). Do communities, for example, have sufficient coherence as entities to be selected as communities? Communities certainly stand toward the top of the evolutionary hierarchy, encompassing multiple populations. Under conditions of tight sociopolitical coupling, we can imagine selection occurring at the community level. However, as this is an under-researched area in organizational evolution, we will leave the issue open for now and return to it in Chapter 11.

Defining Novelty

An evolutionary perspective takes the emergence of organizational phenomena as a key object of explanation, including the genesis of new routines and competencies, of organizational forms that depart from existing modes of organizing, and even of new social institutions. In many respects, these variations constitute the raw material that is subject to subsequent processes of selective retention or elimination. Schumpeter (1934) identified entrepreneurship broadly with 'the carrying out of new combinations'

of such organizing activities. But how do we know when the activities of an individual or group are novel by historical or contemporary standards?

The research literature has tended to apply three standards in judging the novelty of an evolutionary variation, including: (1) an *egocentric* standard that takes into account the intentions of organizational participants themselves; (2) an *altercentric* standard that considers the opinions of selected peers or experts; and (3) a *holistic* standard, which relies on systematic sampling of organizational activities or structures. The egocentric criterion is most appropriately applied when a variation involves an intended departure from existing practices. Ruef (2002a) used this criterion in operationalizing attempts at innovation within a sample of business entrepreneurs. Elaborating on Schumpeter's (1934) categories of innovation, he included activities such as the attempted introduction of a new product or service; the development of a new method of production, distribution, or marketing; the development of new supplier linkages; attempted entry into an unexploited market niche; and the attempted reorganization of an organizational population. Implicitly, historical research often invokes an egocentric standard of innovation, relying on autobiographies, letters, diaries, or public statements produced by entrepreneurs. In his review of the historical literature on Josiah Wedgwood, McKendrick (1961: 30–31) noted that many of the early accounts of Wedgwood's methods drew from the English entrepreneur's personal letters.

An obvious methodological problem that arises with the egocentric standard of novelty is that organizational participants may over- or understate the novelty of their activities, depending on whether their social environment entails pressure toward deviance or conformity. Moreover, egocentric definitions are generally inadequate in judging blind variations, even when applied retrospectively. *Altercentric* definitions seek to counter these shortcomings by relying on the informed opinions of outside experts – e.g. industry specialists, stock market analysts, academics – who are not directly responsible for a purported variation. The most commonly used indicators in this respect are patents or trademarks, which have the advantage of being publicly available forms of external validation that correlate highly with other measures of novelty (Ahuja, 2000). Several drawbacks should also be noted, including the limited ability of entrepreneurs to patent or trademark most organizational variations, the differing propensity and ability among entrepreneurs to seek legal protection for their ideas, and the differing salience of legal protection across historical and national contexts. Both egocentric and altercentric definitions of novelty risk conflating the appearance of a variation with the selective retention of that variation, insofar as the attention of entrepreneurs and experts tends to be directed at successful creative action.

A third, holistic, approach to defining novelty relies on systematic sampling schemes to identify creative action. For example, Scott and colleagues (2000) sought to delineate the appearance of new institutional frameworks in the American health care field, tracking the sector's evolution from its early domination by physician interests to its more recent orientation toward the market. A simple altercentric definition of institutional change relied on the opinions of academic experts and a periodization produced by major legislative events. An holistic definition, on the other hand, tracked all significant regulatory events in the field, as well as a host of quantitative indicators, over half a century. Even though both definitions were in agreement on the periodization of major, discontinuous institutional change, the holistic definition revealed a great deal of incremental transformation that would have been missed otherwise. Naturally, it is far easier to apply such systematic sampling in a retrospective,

historical analysis than in a prospective research design. As Damanpour (1988) has noted, prospective designs that impose an investigators' definition of novelty are likely to miss significant aspects of organizational innovation.

Selection bias

One of the most difficult principles of the evolutionary approach for social scientists to accept is the indeterminacy of outcomes, which must be explained after the fact (Dennett, 1995). An evolutionary perspective treats the future as very much an open question. Rather than directly constructing populations, communities, or societies, people construct solutions to very specific problems. The accumulation of solutions might eventually result in organizations, then populations, then communities, but the process may conceivably require tens of thousands of trials and errors, occurring within historically conditioned constraints. Many accounts of organizational change ignore this sense of indeterminacy.

A methodological consequence of the emphasis on indeterminacy is that research designs examining evolutionary processes must be careful not to select cases based only on successful outcomes. The routines, organizations, and organizational forms that we observe today are outcomes of a long-running evolutionary process. If we only sample the organizational phenomena that have survived, we end up ignoring the numerous failures. Moreover, when our research designs impose such *success biases*, they obscure the selection mechanisms of interest to evolutionary theorists.

Success bias is a special case of a more general problem in research design, called *selection bias*. Sample selection bias occurs when the full range of values on an outcome variable cannot be observed (Berk, 1983). For instance, suppose that we seek to understand the determinants of growth among business firms, but we only have a sample of Fortune 500 companies. If organizational growth is dependent on existing organizational size (see Sutton, 1997), then this sampling criterion effectively constrains the range of outcomes that we obtain, jeopardizing the causal inferences made from our study.

Whereas this type of selection bias pertains to a constraint imposed on *quantitative* variations in outcomes, evolutionary theorists must also be attentive to selection bias that ignores *qualitative* variation. Following our discussion of novelty, let us assume that we seek to explain the emergence of the worldwide automobile industry. Clearly, this will require that we collect data on the industry, as well as the various social movements that legitimated it (e.g. Hannan et al., 1995; Rao, 1994). It is equally important, however, that we develop a *counterfactual* analysis that addresses the alternative modes of transportation that struggled against the automobile, but were subsequently marginalized as substitutes (Klein and Olson, 1996).

Conclusions

Following Ritzer (2006), the evolutionary approach may be described as a *metatheory*, an overarching framework that permits comparison and integration of other social scientific theories. Evolutionary theory applies to many levels of analysis: groups, organizations, populations, and communities. Variation, selection, retention,

and struggle are processes occurring within all social units and across levels. Evolutionary theory does not provide a set of law-like statements governing these processes. Instead, the perspective takes what it needs from other approaches that we review in the next chapter, as befits its eclectic nature. Whether promiscuous borrowing will corrupt its products is not yet clear, but theoretical eclecticism has not seemed to harm other long-lived perspectives, such as 'contingency theory' (see Hodgson, 1993, for a related defense of evolutionary economics).

Major issues are still under debate, including the question of what is being selected in evolutionary processes (e.g. routines versus organizations), how novel evolutionary variations can be defined, and what research designs are most appropriate in capturing the indeterminacy of outcomes that is a key feature of evolutionary analysis. Rather than offering more definitive views on these issues at this stage, we will deepen our understanding of the relevant substantive phenomena in the following chapters and review a range of research designs that address our methodological concerns in distinctive ways.

Study Questions

1. To what extent can an evolutionary approach treat 'external' selection processes as being truly exogenous? Langton pointed out that Wedgwood helped petition Parliament for the development of a transportation infrastructure that would help his factory get products to market. List and explain two principles we can use to take account of the agents that construct a social environment.
2. As managers engage in intentional variation of routines and simultaneously contribute to internal selection criteria, the line between 'variation' and 'selection' can become ambiguous. What distinctions would you propose to help guide evolutionary analysis?
3. Perrow (1985) criticized Langton's study for ignoring the social costs of bureaucracy, such as the coercion and exploitation of workers. Can an evolutionary perspective be applied to understand – and even resolve – social problems, given the indeterminacy of outcomes in this approach?
4. Develop your own critique of Langton's case study, emphasizing the three issues of research design raised in the chapter – i.e. unit of analysis, definition of novelty, and selection biases.

Exercises

1. Pick an organization in which you participate, e.g. as an employee, volunteer, or student. Identify some of the evolutionary mechanisms that allow the organization's practices to persist from week to week.
2. Using each of the three interpretations of 'routines,' identify some routines in the organization you chose for #1 and design a research project to document them.