Essai

Organizing At and Beyond the Limits

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Abstract

当组织试图超越其能力的极限时，意外就会发生。苏尔–
荣誉既包括重大事故，也包括重大发现

Surprises occur when organizations try to exceed the limits of their capabilities. The surprises include both serious accidents and remarkable discoveries. The idea that organizations have limits sheds light on a systemic source of organizational accidents and an important and increasingly prevalent aspect of organizational life. This article discusses various organizational limits and why they exist, it reviews factors that lead organizations to exceed their limits either intentionally or inadvertently, and it points out several reasons why limit violations may be growing more prevalent. Although some organizational limits arise from fundamental characteristics of people or technological systems, nearly all organizational limits result from rather arbitrary decisions about capacities, systems, and structures. In particular, limit violations often stem from uncertain and unintentional exploration. After examining potential consequences and symptoms of limit violation, the article proposes several reasons why researchers should add limits to their agendas for future research.

Keywords: accidents, innovation, capabilities, cognition

Introduction

In the fall of 2004, a group of authors met to present and discuss their contributions to a coauthored book about the disaster that had befallen the space shuttle *Columbia* (Starbuck and Farjoun 2005). One of the last items on the agenda was discussion of a title for their book. They considered various alternatives, none of which received much support, until someone suggested 'organization at the limit'. This proposal struck a chord with everyone in the room. It seemed that every author could relate his or her chapter to the notion that NASA had reached or exceeded the limit of its capabilities.

组织的极限

Because 'organization at the limit' elicited such wide support from some very diverse observers, the authors of this article decided that it would be worthwhile to explore how much sense this phrase might make for various kinds of organizations, not only for NASA. This article proposes that there are limits to organizations' capabilities, and that organizations often meet surprises when they exceed these limits. Most limit violations are unintended, but sometimes organizations' members are trying to exceed limits that they or others believe to exist. Sometimes, organizations' members realize that they are on the brink of exceeding their limits but often they do not realize that they are crossing from

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possible to impossible. The surprises are not always bad, but include both serious accidents and remarkable discoveries.

When an organization exceeds its limits, whether intentionally or unintentionally, even talented and intelligent people with plentiful resources and laudable goals can find themselves incompetent to deal with their challenges. Risks escalate, problems emerge, errors occur, errors are more likely to go undetected and uncorrected, solutions lag or lose their effectiveness, and threats become more ominous. Such consequences may be subtle — inefficiency, deviations from expected performance, unethical acts such as fraud, or employee burnout.

However, limit violations sometimes produce benefits. Imagine that you misjudge the roadway ahead and drive into a sharp curve much faster than you should. Facing imminent disaster, you turn the steering wheel and find that your automobile is skidding around the curve in an appropriate arc. Thus, you discover that it is possible for an automobile to skid around a curve instead of driving around it. You would not have made this discovery if you had driven as you had previously deemed to be correct. Because you went outside the limits of what you had thought was sensible behavior, you discovered a mode of driving that you had not known about beforehand. Does this mean that you will routinely start to drive into other curves at excessive speeds? Probably not. Nevertheless, racing cars do routinely skid around curves; their drivers learn this behavior consciously, often in formal training programs.

The foregoing scenario illustrates how exceeding the limits that one believes to exist can reveal new possibilities. The limits that people perceive reflect those people's specific experiences — the behaviors they have tried, the behaviors they have found to be reliably successful. All people break through the envelope of their previous behaviors at some times, and some people try to break through the envelope of their previous behaviors frequently, as when runners find out how fast they can run by trying to exceed their previous performances. However, most people stay within the envelope of their previous behaviors almost all of the time. For such people, limit violations occur mainly because of perception errors. People may misperceive limits, or misperceive the consequences of violating limits, or both. For instance, Enron's managers knew they were violating legal and professional limits, and they evidently expected that these violations would remain undetected, but they could not know exactly when their actions would exceed the limits of credibility or detectability. Obviously, risk is one influence on such behaviors when people realize that limits exist. What are the expected costs of trying something new and failing? What are the potential benefits of innovation that succeeds? Does continuation of previous behaviors seem to threaten dire consequences?

The next section of this article introduces the topic by briefly surveying some limits that organizations encounter. Ensuing sections consider factors that make organizations more, or less, likely to try to exceed the limits of their capabilities; a few trends that seem to be making limit violations more prevalent; and potential consequences and symptoms of limit violation. The final section proposes some reasons why researchers should add limits to their agendas for future research.

What Kinds of Limits Do Organizations Encounter?

All organizations have limits in the range, amount, duration, and quality of things they can do with their current capabilities, and these limits may originate in their members' perceptions, in their policies, in the technologies they adopt, or in their environments. These multiple sources mean that some observers see limits where others see none; for instance, an organization's members may believe it to be absolutely critical that they complete a project by a specific deadline, whereas outsiders may see this deadline as an utterly arbitrary managerial target. Furthermore, people and organizations do not always know how far they are from the true limits or the extent to which limits are elastic, relative, or arbitrary. Therefore, progress in general, and exceeding limits in particular, entails ambiguity, risk, and uncertainty.

此外，人们和组织并不总是知道他们离真正的限制有多远，或者这些限制在多大程度上是弹性的、相对的或武断的。因此，总的来说，进步，特别是超越限制，会带来歧义、风险和不确定性

Limits may exist primarily in the cognitions of organizations' members. Limits of imagination, foresight, cognitions, and paradigms constrain the ability of organizations to recognize and conceive particular actions, strategies, and behaviors. As our introduction suggested, people may regard the envelope of their previous behaviors as defining ranges of behavior in which they can reliably predict the outcomes of their behaviors. However, this envelope probably has some thickness, as people distinguish between (a) all previous successful behaviors and (b) very familiar successful behaviors. Previous behaviors also set precedents and make resource commitments that impose limits on future possibilities, available skills, knowledge, and so forth. Miller (1993, 1994) and Starbuck et al. (1978) argued that many organizational failures occur because organization members place too much confidence on behavior routines and ways of thinking that have been associated with previous successes, thus turning experiences into straightjackets.

许多组织失败的发生是因为组织成员对与以前的成功相关的行为惯例和思维方式过于自信，从而将经验变成了紧身衣。

许多限制是管理行为的产物

Many limits are the products of managerial actions — time limits for task completion, for example, or budget allocations, or plant capacities. Even when such limits seem utterly arbitrary to insiders and outsiders alike, insiders may act as if the limits are hard and fast restrictions. For example, in January 2001, soon after the Bush administration entered the White House, the International Space Station (ISS) was already US$4bn over its projected cost. The White House and Congress agreed on the 'core complete' — a limited configuration of the ISS that NASA would achieve by February 2004. Originally designed as a management tool to facilitate coordination and efficiency, over time, this deadline became a test of NASA's credibility and, as such, it was 'untouchable'. Trying to meet this deadline severely stressed NASA's organization and decision making.

最初的设计是作为一种管理工具，以促进协调和效率，随着时间的推移，这个最后期限成为对NASA可信度的考验，因此，它是"不可触及的"。为了赶上最后期限，NASA的组织和决策能力受到了极大的压力。

Managerial decisions and organizational policies create limits to physical, human, financial, and informational resources and to organizational processes such as learning, innovation, coordination, and decision making. These limits, in turn, may impose limits on capabilities and performances. Such cascaded limits may be very difficult to anticipate. For example, Sony has expanded into so many business areas that it has blurred its original identity as an engineering innovator. Analysts have said that this murkier image threatens one of the company's most profitable assets: the so-called 'Sony premium', the higher

管理决策和组织政策对物质、人力、财务和信息资源以及学习、创新、协调和决策等组织过程造成了限制

prices long commanded by its electronics products, which still account for most of its revenues (Fackler 2006).

Other organizational limits originate in organizations' environments and are transmitted through laws, market processes, governmental regulations, or institutionalized norms. For example, society and regulatory bodies can set limits on competitive behaviors and CEO compensation. The Sarbanes–Oxley Act put new limits on the governance of US corporations, and the European Union has imposed large fines on Microsoft for refusing to disclose information about its programs. Of course, physical properties and scientific laws limit technologies.

Some of the most interesting limits, at least for academic researchers, are invisible to organization members and possibly to outsiders as well, until events reveal their existence. People discover these limits when their actions no longer have any effects or they have very unexpected effects. Ashby (1960) framed adaptation as occurring at two levels. He pointed out that, in its current form, an equilibrating system can cope with only a range of disturbances; when disturbances fall outside this range, the system has to reorganize. Thus, the system needs an ability to acquire new structures as well as an ability to make effective use of its current structure. In this framework, the procedures that an organization establishes define a system that responds effectively to only a range of problems or challenges, and the system cannot make useful responses to problems or challenges that fall outside this range. When events create problems or challenges that are beyond the organization's current capabilities, survival requires that the organization discover or create new capabilities.

在这个框架中，组织建立的程序定义了一个系统，该系统只能对一系列问题或挑战做出有效的响应，并且该系统不能对超出该范围的问题或挑战做出有用的响应。当事件产生超出组织当前能力的问题或挑战时，生存要求组织发现或创造新的能力。

Events at Microsoft Corporation seem to have revealed some limits on the company's ability to coordinate programming activities well enough to eliminate defects in the resulting programs. Microsoft has sought to exploit its large size by developing new software versions rather frequently. To speed up the creation of new programs, the company has created software by decomposing large programming tasks into modules and assigning each module to a small team of about five people (Cusumano and Selby 1997). Each team works autonomously but it must demonstrate that its module works properly at the end of each workday. Microsoft tracks progress of program development by counting the numbers of bugs reported and the numbers of bugs fixed; and until 1995, the pattern had been that both counts declined rather steadily as programs progressed from their initial rough versions toward the final versions that were released to manufacturing. However, development of the Office suite in 1995 brought a surprise. After declining for several months, the counts of bugs reported and bugs fixed became stable. Each day, testers reported finding approximately the same numbers of new bugs as the day before, and each day, programmers said they had corrected approximately the same numbers of bugs as the day before. After several weeks of work that produced no improvement in either count, Microsoft released the software to manufacturing. Evidently, what had happened was that the suite of Office programs had grown so complex that autonomous teams could no longer master its complexity: each time a team fixed a bug in its own module, the changes it made created unforeseen new bugs in other teams' modules.

Why Do Organizational Limits Exist?

Limits are both essential and useful. All of the concepts on which organizations rely — such as order, purpose, choice, power, conflict, division of labor, coordination, trust, reliability, and accountability — require or assume limits of some sort. Organizations place limits on what constitutes acceptable behaviors of their members as well as the rights they give to nonmembers, and these limits govern participation, goal formation, trust, and accountability (Aldrich 1999). For example, organizations use rules, routines, and roles to limit behavior and make it more predictable. These limits, in turn, allow the formation of stable expectations that enable people to think about the consequences of action (Simon 1997:110). Similarly, a firm's resources and the capacities of the firm's management team limit the extent and direction of the firm's growth (Penrose 1959).

Many organizational limits, particularly those deliberately set by people, exist because they appear to serve, or once served, useful functions. Limits can provide security, stability, balance and consistency, and reference for improvement. Organizations and people use the limits they perceive, to help them to identify their strengths and vulnerabilities, to define their identities, to remain down to earth and pragmatic, and to develop a sense of humility and proportion.

Organizations' limits also facilitate specialization and innovation, as they delineate opportunities and potential competition for neighboring organizations. For example, Starbuck and Dutton (1973) pointed out how the existence of mass-produced, standardized products creates business opportunities for small competitors that can tailor their products and delivery schedules to the needs of specific customers. Similarly, terrorist and guerrilla groups exploit the limitations of large military and defense organizations. Organizations have limited capacities to act upon innovative ideas and to promote individuals; these natural organizational limits often give rise to the founding of new ventures and spin-off organizations.

Other organizational limits, often ones that are unrecognized or ignored, develop gradually through historical processes and interactions. Organizations may promise too much and overstep their capabilities, not so much as a result of conscious design but as responses to cumulative flows of events or as unintended by-products of decisions and actions. The tale of the high-velocity train Acela provides an illustration.

Acela, which promised to speed travel between cities of the northeastern USA and to be a model for a nationwide fast rail system, has never achieved its promised speed targets and, in 2005, Amtrak announced that it would sideline all 20 Acelas to replace cracked brakes. The main reasons Acela failed to fulfill Amtrak's promises were a history of political pressures, tight budgets, contested regulations, and design changes (Dao et al. 2005). Facing financial difficulties and decreased federal subsidies, Amtrak faced intense pressure to deliver its new train as quickly as possible, and that pressure spawned a series of mishaps. Some of these problems originated in the bidding phase, where Amtrak chose to work with a coalition of Bombardier Inc. of Canada and GEC Alstom of France. Because cutting costs was crucial, Amtrak selected the lowest bid and the best financial deal: Bombardier's bid was heavily subsidized by the Canadian government. Since an ideal off-the-shelf train did not exist, Amtrak

selected a new design, which turned out to be too revolutionary. Then, during design and production, Amtrak ordered 9000 engineering changes, which increased costs, delayed production, and added thousands of pounds of extra weight. To meet strict US safety regulations, the French-Canadian manufacturers made the train twice as heavy as European models. This added weight contributed to a series of problems, including the defective brakes and slower speeds, as heavier trains are harder to start and harder to stop. Unlike the creators of the most successful European train systems, Amtrak did not lay straighter tracks and replace aging wires, and Amtrak was embarrassed to discover that the coaches were 4 inches (10 cm) too wide to use fully their tilting mechanisms that could have allowed the trains to speed around curves. As a result, the trains had to go slow in many places and trip times were slow.

Both Amtrak and the train manufacturers exceeded their limits. Although some of these limits came from environmental constraints that imprinted the project from its very beginning, others evolved over the years through interaction. Amtrak overestimated its capacity to absorb a revolutionary train design, and the train manufacturers overestimated their ability to meet specifications on time. Most likely, the initial contacts and contractual arrangement led each party to overestimate the capabilities of the other.

Why Do Organizations Exceed Their Limits?

A Simple Analogy

The authors of this article had barely begun to draft it when we realized that we were falling into disagreement over issues of interpretation and attribution. The limitations on organizational capabilities incorporate both human and environmental factors, so it can be difficult to separate human errors or achievements from environmental demands or gifts. We found a simple analogy to be very helpful in helping us to understand why it is difficult to identify the causes of limit violations.

Suppose that you come upon the site of an automobile accident. While rounding a curve, a car has veered off the side of the pavement. Why did this accident happen? Was the car traveling too fast, thus violating the physical limit imposed by the curvature of the road and the friction of the road surface? Or did the driver steer incorrectly and simply guide the car off the road?

Since the automobile had a driver, a human was ultimately responsible to some degree. Likewise, since organizations are composed of people, these people bear some responsibility for the events that organizations experience. However, people's contributions to accidents can vary from extreme to slight. The driver might have been engrossed in a conversation on a cell phone; the driver's heavy foot might have had the automobile traveling much too fast for even excellent road conditions; the designers of that roadway might have made the curve abnormally sharp; the highway department might have left the curve unmarked; the roadway might have had a patch of oil or ice.

Because organizations involve many people that are performing different tasks, and complex organizations operate simultaneously in many environments,

因为组织涉及许多执行不同任务的人，而且复杂的组织在许多环境中同时运作

it is usually difficult to pin down the factors that cause organizational surprises. This article focuses on surprises that have systematic causes, and, for such surprises, multiple observations may be very helpful — even essential. Consider the following possibilities:

Case A. The same car has run off the road several times in different places and with different drivers.

Case B. Several different cars with different drivers have run off the road in the same place.

Case C. The same driver has run off the road several times in different places and with different cars.

Case D. Several different cars with different drivers have run off the road several times in different places.

Of course, cars, people, and roads are factors in all cases. However, in the absence of additional information, Case D suggests that each accident may have had a unique cause; there is no reason to look for systematic violations of limits. Case C seems to involve errors that are associated with a specific driver, who might have personal limitations. If Case C shows systematic violations of a limit, they occurred in a regulatory environment that allowed an unusually deficient driver to continue driving. Cases A and B represent two kinds of limit violations that involve technologies and are not solely attributable to human errors. In Case B, there appears to be something wrong with that specific section of roadway. Perhaps that section has limits that are unlike those of other roadways, so drivers do not anticipate them. In Case A, there appears to be something wrong with the car. Perhaps the car has limits that are unlike those of other cars, so drivers do not allow for them. Of course, limits associated with a roadway or automobile may arise from decisions made by people such as civil or mechanical engineers; however, it is not those decision makers but the results of their decisions, rather, that are imposing limits at the times of the accidents.

One can see parallel cases concerning the limits that organizations face. Hurricane Katrina looks like both Cases A and B in that an environmental event exceeded limits that were built into organizations. This storm was much stronger than previous hurricanes, so flood-control systems that had been designed for normal storms were quite inadequate to the demands on them. Displaced people vastly exceeded the capacities of transportation and relief services, exhausted emergency food supplies, and overwhelmed facilities such as temporary electrical generators in hospitals. The situation also demonstrated that the Federal Emergency Management Agency was quite inadequate for a significant emergency. The Enron debacle looks like Case C in that a specific corporation violated several different laws and behavioral norms. Since Enron violated several commercial laws and it broke implicit contracts with its employees and customers, there is no doubt that the company was responsible for these violations. However, several other organizations shared responsibility with Enron. The existing system of public auditors and governmental regulators were allowing Enron to continue acting illegally and dishonestly, investment bankers were abetting Enron's deceptions, and purchasers

of electricity were assuming that competitive markets were producing fair prices. Indeed, external controls on Enron's behavior were so weak that the company ventured farther and farther into fantasies of imaginary projects and deceptive accounting, until its financial structure imploded. Both examples suggest that although some organizational limits may arise from fundamental characteristics of people or technologies, nearly all organizational limits result from rather arbitrary decisions about capacities, systems, and structures.

The discussion in this section generally progresses from causal factors in organizations' environments to causal factors in organizations' internal processes or management. However, as the metaphor in this article's introduction illustrates, such attributions are nearly always unclear and limits often reflect multiple causes. Organizations can choose and influence their environments; environments lay down specifications that organizations are supposed to satisfy. Technological possibilities usually come from organizations' environments, but managers or engineers select specific technologies and decide how to use them (DeSanctis and Poole 1994).

Factors with Strong Environmental Elements

One pervasive cause of limit violations is the philosophy of maximization — people trying to extract the absolute maximum from their resources or activities. This philosophy is widespread throughout western societies, but some organizations express it more than in others. It seems to be stronger in business firms that are striving to increase their profits or to reduce their losses; it seems to be stronger in organizations that are growing rapidly, struggling in declining industries, or trying to innovate technologically. This philosophy has also fluctuated in strength, as it has characterized fads in managerial practices such as downsizing, outsourcing, and reengineering, and it has characterized newly acquired firms during waves of acquisition.

The philosophy of maximization means that no level of performance is ever high enough. There is always a possibility of making small changes that will yield even higher performance. Starbuck and Milliken (1988: 335) characterized this behavior as 'fine-tuning'. They said:

'successes may induce engineers and managers to attempt to fine-tune a socio-technical system — to render it less redundant, more efficient, more profitable, cheaper, or more versatile. Fine-tuning rarely raises the probability of success, and it often makes success less certain …

'Fine-tuning changes always have plausible rationales, so they generate benefits most of the time. But fine-tuning is real-life experimentation in the face of uncertainty, and it often occurs in the context of very complex socio-technical systems, so its outcomes appear partially random.

'Fine-tuning changes constitute experiments, but multiple, incremental experiments in uncontrolled settings produce confounded outcomes that are difficult to interpret. Thus, much of the time, people only discover the content and consequences of an unknown limitation by violating it and then analyzing what happened in retrospect.'

Turbulent and demanding environments force organizations to reformulate their structures and goals frequently, to experiment and innovate often, to undo and

redo tasks, and to rethink issues. Although moderate amounts of innovation and change help to prevent complacency, too much innovation and change take organizations beyond the amounts that they can handle, and thus create confusion, ambiguity, stress, and waste. For example, the USA's attack on Iraq produced a turbulent political situation: because the USA's leaders had already sent soldiers to Afghanistan and the leaders had anticipated an easy victory and a complaisant populace in Iraq, they had provided far too few soldiers to control the country and they did not prepare for long-term occupation of hostile territory (Woodward 2004). Shiites and Sunnis began to kill and kidnap each other; angry Muslims from all around the world traveled to Iraq to participate in attacks on US and British military forces; insurgents or opportunists stole vast amounts of armaments that had been in storage; insurgents destroyed oil pipelines and refining equipment and they attacked US troops in ways that the US military had not anticipated, including roadside bombs. Former allies that had warned against the attack on Iraq refused to support the USA afterward. The actual costs of warfare in Iraq vastly exceeded the pre-attack estimates. As the US populace gradually realized how badly the attack had turned out, the President's popularity plummeted to previously unseen lows. Apparently to distract attention from Iraq, the President introduced various proposals for domestic legislation about retirement savings, medical costs, and even fanciful bans against flag burning and marriage between homosexuals, but all of these proposals failed. Then the President's political supporters demanded stronger efforts to reduce illegal immigration into the USA, but the President could make no serious responses because funds and troops were already committed in Afghanistan and Iraq. At the same time, North Korea and Iran were moving toward the development of nuclear weapons and missiles to deliver them; when the USA threatened to respond militarily, North Korea and Iran seemed to ignore these threats.

The turbulent situation in Iraq was not entirely environmental. Iraq was not turbulent before the US invasion, and the turbulence was a reaction to this invasion. In January 2003, a large group of American CEOs met to discuss various current issues affecting their companies, and one topic was the possibility that the USA might invade Iraq. Several of the CEOs expressed concern that an invasion would have negative effects on their companies' business relations in the Middle East. Also present at this meeting were some people who had once held senior positions in the US Departments of Defense and State, and every one of these people warned that war always produces surprises. The actual developments in Iraq show why this proposition has validity. First, some of the US troops committed various crimes that made them look despicable, and the USA look immoral. Second, the invasion polarized opinions. People who had previously been rather neutral decided to support either the USA or the insurgents, with one consequence being many new recruits for the insurgents. How neutral people would align themselves was very difficult to anticipate, because the neutral people had no reason to indicate their sympathies previously. Third, the invasion activated long-standing animosities among Kurds, Shiites, and Sunnis, producing much violence and further polarizing opinions in Iraq and other countries. Fourth, the insurgents sought ways to respond that would surprise the US military and would take advantage of new opportunities that the invasion created. For example, they broke into the

Iraqis' unguarded arms caches and stole weapons and they attacked the US troops in ways for which the US troops were poorly prepared.

Indeed, environmental turbulence and uncontrollability are predictable results not only of warfare but of aggressive competition more generally. Those threatened by competitors' actions seek effective responses, so they try to make responses that surprise their competitors and take advantage of their competitors' weaknesses. Thus, aggressive competition involves efforts to induce competitors to exceed their limits. Aggressive competition also elicits polarization of public opinion and spillovers into adjacent industries or regions. These effects redefine environmental structures in ways that are difficult to anticipate, but likely to undermine the effectiveness of long-standing policies and strategies. Indeed, environmental changes that are difficult to predict and that undermine the effectiveness of current policies and strategies are probably the crucial property that makes an environment seem turbulent and uncontrollable to the organizations in it.

Turbulent and ambiguous environments increase perception errors, as familiar or routinized perceptions become less effective. One result is people and organizations making erroneous judgments about their own and others' capabilities and exceeding their limits inadvertently, or receiving pressure from others to exceed their limits. Such environments bring novelty, excitement, excess, and freedom, which reduce the abilities of individuals and organizations to control events. Turbulent and ambiguous environments also bombard people and organizations with opportunities (e.g. to buy more goods, to acquire more firms, to undertake more interesting projects). Thus, they may be seduced into making too many promises, pursuing too many opportunities, or overstepping their capabilities. Hallowell (2006) suggested that modern-day existence leads to a widespread malady that shares many symptoms with Attention Deficit Disorder (ADD). Being in a constant rush, people tend to lose focus mid-task and to fail to complete tasks. IBM's former CEO, Lou Gerstner, expressed a similar idea when he warned that a company pursuing too many projects and challenges is likely to run out of cash (Gerstner 2002).

Environments may also exert pressures that render some problems unsolvable, by simultaneously demanding certain outcomes while also blocking actions to produce those outcomes. As a result, actions to solve some problems create or amplify other problems. Such interactions place subtle and elusive limits on the changes that organizations can make. For instance, in many societies, accepted values both insist that managers should take responsibility for all actions by their subordinates and assert that organizations should uphold democratic norms. Since an organization cannot be simultaneously democratic and undemocratic, hierarchical and egalitarian, organizations in these societies struggle to reconcile these conflicting demands. They attempt to make hierarchical control less visible by asking managers to show 'consideration' or to set goals for their subordinates through mutual discussions, which cannot be truly mutual. Or they attempt to substitute group supervision for managerial supervision, which subjects individual workers to even more control and adds the risk that groups will deviate from organization-wide goals. Because such efforts cannot overcome the truly fundamental conflicts between freedom for people and organizational coordination, attempts to give individuals more freedom

may inadvertently degrade organizational coordination too much, or attempts to strengthen coordination may inadvertently deprive individuals of cherished freedoms. Although organizations might, in principle, anticipate the interactions, the history of management practices is replete with temporary fads, and organizations have been prone to ricochet back and forth between excessive democracy and excessive authoritarian control (Abrahamson 1996).

Inconsistent demands are widespread because almost all actions have both positive and negative consequences, one result being that actions taken to meet one set of demands are likely to push organizations beyond their capabilities in other directions. Government agencies hear numerous demands for actions that counteract each other: one reason is that politically relevant proposals have proponents and opponents. For example, although some citizens want their postal service to deliver mail cheaply and efficiently, other citizens want their postal service to provide employment for disabled people or to pay postal workers higher wages. A second reason is that politicians view services such as postal delivery as inevitable expenditures that they would like to redirect to satisfy unrelated demands such as employment for political cronies or benefits for their political supporters. However, business firms and not-for-profit organizations also have to deal with inconsistent demands from their environments. For instance, the profit that businesses are supposed to pursue is revenues minus costs, but revenue-increasing actions tend to increase costs, and cost-reducing actions tend to decrease revenues.

Technological Factors

Likewise, technological innovation can yield benefits but innovations can produce unexpected harm. People ask for rapid improvements while also insisting on careful testing and no harmful side-effects. Of course, more testing implies slower innovation.

Complex technologies compel organizations to develop complex structures and complex management processes, and unreliable technologies compel them to develop detailed inspection and warning systems (Perrow 1999). However, complex organizational structures and processes entail gaps in coordination and communication and inconsistencies in decision making, with the result that organizations perceive technologies as being more complex and they have more difficulty managing technologies reliably. Thus, each organization faces limitations on the complexity of technologies it can manage.

NASA is an example of an organization struggling with complex and unreliable technologies. NASA's space shuttle has many thousands of components, and thousands of these are critical to the success of a flight. Because there are so many components, NASA has been reluctant to adopt new technologies that entail some experimental risk. However, slow innovation has also meant that NASA has not replaced unreliable components and that components have grown older and older. NASA has responded to its technological challenges by adding hierarchical layers and occupational specialties that have narrowly defined functions. Such complex organizations have narrow behavioral repertoires that respond poorly or inappropriately to rather small deviations from normal.

Factors with Strong Organizational Elements

Whereas environmental and technological limitations may seem obdurate and exogenous, limitations that arise mainly from management and organization are clearly endogenous and they usually seem ambiguous and arbitrary. However, the apparent changeability of managerial and organizational limits actually contributes to the dangers they create because people tend to assume that they need not respect limits that appear to be changeable. Among the possible causes of managerial and organizational limitations are large size and much fragmentation, slow learning in the face of changing problems, weak prioritization of goals, and managerial facades and hubris.

管理和组织限制的表面可变性实际上助长了它们所造成的危险，因为人们倾向于认为他们不需要尊重那些似乎是可改变的限制

Large size forces organizations to decentralize, and decentralization can degenerate into disordered fragmentation. Although some organizations operate effectively despite being very large, large size generally implies geographic dispersion that fosters diverse economic and political agendas, and this diversity impedes coordination and cooperation. Microsoft's problems with software development show interactions among the organization's size, its strategic ambitions, and its technology. Microsoft's growing size and prior success led it to aspire to create more and more complex programs, for example integrating the word processor (Word) with the spreadsheet (Excel) and with the calendar (Outlook) and with the presentation system (PowerPoint). However, programming demands attention to minute detail, which led Microsoft to decompose the overall programming task into small modules assigned to small teams, and the number of teams multiplied with the company's growing size and the increasing functions incorporated into Windows and Office. Fragmentation meant that the teams were changing their own program modules autonomously without much awareness of the interactions between modules, and these autonomous teams could not cope with the complexity of program integration. As a result, Microsoft was unable to produce defect-free programs, and the company began to see defects as inevitable. Microsoft's ambitious business strategy called for program integration, program complexity, and the repeated issuing of new program versions. However, Microsoft was able to meet its new-version goals for only a few years. The version that was supposed to be Windows 97 turned into Windows 98; the version intended to become Windows 2002 grew so late that the company dropped the date-name and called it Windows XP. The versions of Windows scheduled to come out in late 2004 or early 2005 did not reach customers until late 2006 and early 2007.

大的规模迫使组织去中心化，有些能有效运作，但往往去中心化会退化成无序的碎片化

Because organizational fragmentation loosens the connections between perceived problems and attempted solutions, large organizations tend to react slowly. In effect, large size limits an organization's ability to change. General Motors corporation affords a current example. Once the world's largest companies, GM has been losing market share for many years to more innovative and faster-acting competitors. Whenever consumers have changed their preferences, GM's competitors have quickly introduced new models to satisfy these preferences, while GM has responded more lethargically. Ironically, General Motors once had the reputation of being a proponent of 'planned obsolescence', because it made annual changes in product features that were supposed to induce buyers

因为组织的碎片化弱化了感知到的问题和尝试的解决方案之间的联系，大型组织往往反应缓慢。实际上，大的规模限制了组织的变革能力

to replace older vehicles. However, as GM grew larger, its frequent product changes degraded the quality of its products and its competitors took market share by emphasizing high product quality. Thus, GM helped to create an environment in which it has had trouble surviving.

Although inability to absorb change limits organizations' ability to learn from experiences, many organizations have learning limitations that are more fundamental — erroneous perceptions of environmental changes, difficulties analyzing environmental changes, impediments arising from organizational politics. Slow or ineffective learning keeps organizations from adapting successfully to changes in their personnel, technologies, or environments. To remain effective in rapidly changing environments or when using rapidly changing technologies, organizations need to be able to learn rapidly. Of course, since organizations choose their environments and technologies, the issue is partly one of business strategy. For example, the Microsoft case cited above involved at least two limit violations arising from inconsistencies between the company's strategies and speed of adaptation — the quality of programs (numbers of defects) rose from negligibly few to significantly many, and the frequency of program revisions dropped far below the company's targets. Likewise, GM might have been able to raise its product quality if it had been willing to change product features more slowly.

Indeed, research suggests that many organizations may have extremely weak capabilities for learning, as both success and failure may limit organizations' capabilities for learning. After analyzing the histories of 36 firms, Miller (1993, 1994) surmised that long periods of continued success foster (a) structural and strategic inertia, (b) extreme process orientations, (c) inattention, and (d) insularity. Learning includes the elimination of what appear to be extraneous activities, with the result that firms become simpler, less aware of events happening outside their immediate domains, and less capable of diverse actions. For instance, a focus on core competence and competitive edge, which initially helps a firm to succeed, tends later to make the firm more specialized and inflexible. Miller (1990: 3) summed up his studies by saying: 'Success leads to specialization and exaggeration, to confidence and complacency, to dogma and ritual.' Yet failures also limit learning. Baumard and Starbuck (2005) found that a large telecommunications firm had learned almost nothing from its strategic failures. Managers viewed large failures as having idiosyncratic and largely exogenous causes, and they interpreted small failures as demonstrating the foolishness of making experiments that deviated from the firm's core beliefs. As well, the managers of failed ventures moved to new posts within the parent organization, taking their learning to domains where it became irrelevant.

Members of organizations create facades that conceal activities or results they want to hide (Nystrom and Starbuck 1984). They create facades to portray performance as better than it was, to suggest that work processes are more efficient than they were, to make organization structures appear more logical than they are. Although some facades are useful, facades can disconnect an organization from its environment and limit both its performance and its adaptive capabilities. In one egregious case, the B. F. Goodrich Company attempted to supply the US Air Force with an aircraft brake that was incapable of stopping an airplane (Vandivier 1972). Because Goodrich had previously supplied a

brake that performed poorly, it offered to supply these new brakes for a ludicrously low price that won the contract. Then, in an effort to produce the brake at a low cost, the Goodrich's design engineer specified a brake that had too few disks. When laboratory tests indicated that this brake did not satisfy the contract specifications, the company did not redesign the brake but instead falsified the test data. When low-level personnel attempted to insert a statement in the test report indicating that the brake did not meet the specifications, their supervisors deleted this statement. As was inevitable, of course, the plane builder eventually installed the brake in a real airplane for tests. The resulting brake troubles caused several near-crashes during landings. In one instance, the intense heat developed during a landing welded a brake together, and the airplane skidded for 1500 feet (460 m).

One effect of managerial facades is to create confusion about priorities, as do many other factors, such as environmental pressures and managerial ambitions. Unclear priorities among goals limit organizations' abilities to achieve their goals. Unclear priorities induce organizations to waste resources on low-priority activities and to perform primary activities poorly, and they put stress on organizations' abilities to monitor their activities and to spot burgeoning trouble. Of course, many government agencies have unclear and confused priorities because the politicians who control their funding demand that the agencies pursue goals that are unrelated to their central missions. NASA affords one example. The presidents and members of Congress who control NASA's funding must face re-election campaigns in two to four years, and so they have little patience for goals, such as space travel and exploration, that require time horizons of many years. As a result, the presidents and members of Congress perennially demand that NASA should pursue various goals that are unrelated to space travel and exploration. According to the audit report issued by NASA's Inspector General in March 2001, NASA was attempting to achieve 211 'performance targets'. These goals included better transportation of farm livestock, communication to and employment of people having limited English proficiency, design and construction of conventional commercial aircraft, dissemination of technological knowledge, environmental protection, medical diagnosis, military defense, and research by faculty at universities having many minority students. Confused priorities also occur in business firms. Although businesses supposedly focus on gaining profits, the relations of profits to actual activities is usually ambiguous, and business decision makers have to make judgments about the trade-offs between long-run and short-run goals. Business people have also shown tendencies to adopt faddish programs, such as reengineering, downsizing, acquisitions, and so forth, that generate alternating cycles of activity. For instance, a wave of acquisitions that created 'conglomerates' was followed by a wave of divestitures that aimed to orient firms toward their 'core competences'.

Finally, organizations may be driven to try to exceed their capabilities by senior executives who pursue unrealistic goals because of their insecurity, ambition, greed, hubris, jealousy, or competitive zeal (Hayward and Hambrick 1997; Sirower 1997). For example, around 70% of corporate acquisitions are unprofitable for the acquiring firms, and there has been much publicity and public discussion of this phenomenon. Indeed, stock markets usually lower the estimated

不明确的优先级导致组织将资源浪费在低优先级的活动上，并将主要活动执行得很差，并且它们给组织监控其活动和发现新兴问题的能力带来压力

value of an acquiring firm within minutes of an acquisition announcement, so executives have good reason to be skeptical of the promised benefits from an acquisition. Yet, the unprofitable acquisitions have continued, and the percentage of unprofitable ones has remained rather stable, suggesting that many senior executives believe they can turn unprofitable situations into profitable ones.

Why Are More and More Organizations Going to Be Exceeding Their Limits?

Technological and social trends imply that organizations are likely to become increasingly prone to exceed their capabilities. Although long-run technological developments are impossible to predict in any detail, two general trends seem almost certain to continue: telecommunications and transportation are becoming faster and cheaper. Both trends have made the globe smaller and more interdependent. Transoceanic travel more than tripled from 1985 to 1998, and transoceanic communications multiplied 28 times from 1986 to 1997.

One consequence of these accelerations has been that many companies operate in scores of nations. In 2006, the global company with the largest revenues was Exxon Mobil, which operates refineries in 26 countries, retails fuels in 100 countries, and sells lubricants in 200 countries and territories. The second largest company, Wal-Mart Stores, employs 1,800,000 people who operate 6600 stores in 15 countries. British Petroleum has refineries in 19 countries, does exploration in 26 countries, and operates retail outlets in 100 countries. Daimler Chrysler's 383,000 employees manufacture in 37 countries and sell products in 19 countries, and its stock trades on 19 exchanges in seven countries. One consequence of such globalization is that companies have to span more cultures, languages, and time zones. Global companies need employees who speak many languages, who understand many cultures, and who maintain working hours that correspond to the locations of those languages and cultures. Thus, global companies face both socialization challenges and coordination challenges that are much more complicated than the ones of companies operating in a single time zone using a single language. Global companies also encounter more environmental complexity, more potential competitors in local markets, and more diverse demands on their technologies. For instance, companies using technologies developed in temperate zones may discover that they need different technologies when they venture into the Arctic or the desert. Complex environments render it more likely that outcomes uncouple from intentions and therefore increase the likelihood of unintentional limit violations.

Faster, cheaper telecommunications and transportation might not produce larger and more complex organizations that have more difficulties with coordination. Faster telecommunications can facilitate communication among semi-autonomous subunits. Companies might engage in simplification programs such as downsizing, outsourcing, or reengineering. However, companies have been growing larger for more than a century — basically, since corporations began to acquire their current legal parameters — and so the trend toward complexity seems to be robust.

Some large, global business firms appear to be taking on more properties of national governments. The world's population is growing rapidly and 95% of this population growth is occurring in economically undeveloped areas, so populations are outstripping the available resources. The percentage of the world's population that is very poor is increasing while the very affluent percentage is decreasing, and armed conflicts are escalating (National Defense Council Foundation 2002; Shell International 2002; United Nations 2002, 2004). National identities have been a major proximate cause of armed conflicts because national governments think locally, not globally, and the most conflict-filled areas have very small middle classes. Corporations, on the other hand, abhor threats to their investments such as political instability and armed conflict, and they need middle-class suppliers and customers. Many corporations are as large as national governments financially; at least 1000 companies have revenues that exceed the median budget of countries monitored by the World Bank. The large global companies also are losing their nationalities, as their senior executives, employees, customers, and suppliers come from outside the companies' home nations. Therefore, large, global companies are finding themselves at cross-purposes with the governments of their various host nations, and they are sometimes developing policies and practices to supplement or replace those of national governments. As companies venture further into domains that have been governmental, their goal structures, managerial hierarchies, and decision processes become more complex.

Global telecommunications may also be multiplying perceptions of opportunities. Although spectacular successes, such as those of Google and You-Tube, are rare, their rareness attracts media coverage that amplifies their visibility, and as news reporting expands globally and the numbers of news channels increase, more and more success stories are being reported. The news reports almost always portray spectacular successes as being explicable and imitable, not products of idiosyncratic situations.

Social trends also imply that organizations are likely to become increasingly prone to exceed their capabilities. Humanity has had growing ambitions to pursue larger and more difficult projects — larger dams, faster railways, larger airlines, taller buildings, permanent stations in Antarctica, oil wells in the Arctic, exploration of Mars. These projects often require larger organizations and they always involve real-life experimentation at the edges of knowledge. Another long-term trend has been an increasing number of people who have large amounts of education. Such people enjoy autonomy and they dislike working under close supervision, so hierarchies have become flatter and coordination has shifted from detailed methods to general goals. Flatter, looser organizations offer more opportunities for people to express their personal hubris, greed, ambition, or insecurity, and they tend to engage in more experimentation. More educated workers and faster telecommunications have been making organizational boundaries more permeable. Highly educated workers have tended to change jobs, which undermines corporate secrecy. Modern telecommunications support electronic communities that bridge over organizational boundaries; consider, for example, the numerous cases in which theft of laptop computers has compromised databases that were supposed to be extremely secure. Of

course, permeable boundaries make organizations less stable, make innovation less systematic, and make plans less likely to pan out. Another social trend has been the strong influence of financial markets that are very unstable and that emphasize short-run results. Companies have been using financial markets to measure their performance, which means that corporate performances depend upon external economic conditions and they are significantly out of the control of the corporations' actual actions. As well, the emphasis on very short time horizons has discouraged organizations from developing long-run plans and encouraged them to trade long-run benefits for short-run benefits.

Still another social trend, visible primarily in the USA, has been increasing centralization of corporate control and the idolization of CEOs. Before and around the beginning of the 20th century, law and public opinion viewed businesses as property owned by identifiable people, who employed managers to oversee their property (Starbuck 2003). Such managers kept records and relayed instructions, but few of them exercised power on their own. However, such a conceptualization of managers grew less and less tenable throughout the 20th century. Over seven decades ago, Berle and Means (1932) reported that stock ownership in large US corporations had so dispersed that nearly all stockholders held very small amounts of stock, with the result that stockholders of about half of the largest corporations could not exert effective control. Managerial control has increased greatly during the ensuing 70 years. Today, large majorities of stockholders cede their voting rights to companies' senior executives, who therefore control the decisions made at shareholders' meetings, including the 'elections' of directors. Grateful directors have been rubber-stamping executives' decisions and endowing executives with vast wealth (Hymowitz 2003: R3). Whereas the average chief executive of a large US corporation made 42 times the pay of a typical American factory worker in 1980 (Reingold 1997), this ratio had risen to 431 times by 2004. Two side-effects of executives' control has been a belief that CEOs have tremendous influence on corporate profits and a belief that some especially talented CEOs have the ability to produce vast profits. Although research has indicated that these beliefs are ill-founded (Khurana 2002), the beliefs seem to have firm footing in the business press and on Wall Street. Thus, CEOs, at least some of them, face pressure to deliver remarkable organizational performance and have reason to think that they can actually deliver remarkable organizational performance.

最后，存在一个正反馈循环，在这个循环中，违反限制会催生更多违反限制的行为。当组织超越极限时，他们可能会在这个过程中发现新的可能性，升级他们的能力，并扩大他们的极限。此外，当组织超出其能力的限制时，其后果会改变其环境

Finally, there is a positive feedback cycle in which limit violations nurture still more limit violations. When organizations exceed their limits, they may discover new possibilities, upgrade their capabilities, and expand their limits in the process. In addition, when organizations exceed the limits of their capabilities, the consequences alter their environments. If the organizations appear to have succeeded, to have produced exceptional results, exceptional results come to be expected. For example, when NASA succeeded in landing on the moon, both people within NASA and the American public decided that NASA was not a typical organization. NASA had a magical aura; it had achieved the impossible. It had successfully completed missions with hardware that supposedly had very little chance of operating adequately (Boffey 1986a). A former NASA budget analyst, Richard C. Cook, observed that NASA's 'whole culture' calls for 'a

can-do attitude that NASA can do whatever it tries to do, can solve any problem that comes up' (Boffey 1986b). When organizations achieve rapid technological innovations, one result is increased pressure on other organizations to innovate rapidly, and another result is the creation of new opportunities, including entirely new industries. Thus, the organizations' environments become less stable and less well understood.

What Happens When Organizations Exceed Their Limits? 当组织超越极限时会发生什么

Organizations face a tension between exploration of new possibilities and exploitation or protection of current assets, and one usually comes at the expense of the other (March 1991). When organizations explore beyond the limits of their perceived capabilities, they face uncertain consequences that may produce tragic consequences, yield new knowledge, or expand their abilities. When organizations stay within their perceived limits, they can get into trouble by playing too safe, never testing their abilities, failing to upgrade their capabilities, and just drifting along. Positive and negative outcomes often develop together and interact, and organizations engage in multiple activities and pursue multiple goals and therefore follow multiple developmental paths simultaneously. How can organizations that are simultaneously pursuing both exploration and exploitation balance the benefits of exceeding limits against the risks of violating limits? Moreover, neither pattern has to be permanent. If organizations discover new opportunities, they can shift from an exploitative, protective mode to an exploratory, venturesome mode. If organizations anticipate that they are about to incur dire consequences, they try to avoid doing so. 如果组织发现了新的机会，他们可以从利用、保护模式转变为探索、冒险模式。

Canada's air transportation system is a large socio-technical system composed of a multitude of organizations including airports, airlines, cargo operators, air controllers, and regulatory agencies. It encompasses more than 6000 airports, 60 million passengers, and 4.3 million takeoffs a year. The system is straining to keep pace with increasingly crowded skies, and forecasts say traffic may double within the next decade. Airlines are increasing flight rates, cutting costs, and striving to operate on time. In addition, airplanes are becoming more complex. Although technological advancements have improved reliability, they have also added complexity that requires attention to detail and expertise from maintenance personnel. Moreover, the system relies on everyone — from commercial and weekend pilots to air traffic controllers — to follow complex and variable rules in a 400-page manual and a thick book of charts (Cribb et al. 2006).

As one observer put it: 'All the bells and whistles are continually pushed to the limit in order to become more profitable and to squeeze more airplanes into more airspace, and then when something goes wrong, you have less outs and less room to maneuver.' Indeed, there are troubling signs: commercial airlines have mechanical problems with great regularity; many problems go undetected; there is a steady increase in alleged violations of aviation regulations; and some safety statistics are worsening. Several of the most basic regulatory and quality control tasks have deteriorated. Incidents that did not lead to calamities receive less careful investigation due to lack of workers. Mechanics report feeling pressures to cut

corners and to put planes in the air with defects that could compromise safety, but airlines have suspended mechanics who voiced such opinions in public. If the predicted doubling in air traffic occurs, even the current level of performance is likely to yield disasters. However, if and when the Canadian Air Transport System does indeed reach the limits of its technological, human and organizational capabilities, it will certainly strive to keep itself within limits to the best extent possible.

This example illustrates many of the issues surrounding organizations that exceed their limits: the kinds of limits organizations encounter, the origins of these limits, and the reasons organizations exceed their limits. However, the example provides other lessons regarding the consequences, symptoms, and potential remedies for limit violation. Exceeding limits may lead to positive outcomes such as more travel, higher profits, and technological innovation, as well as negative outcomes such as errors, accidents, and calamities. Positive and negative outcomes often develop together, as when efforts to increase on-time performance strain resources devoted to other outcomes such as safety. Symptoms of a system nearing its limits manifest themselves in both visible and subtle warning signs amid signals that create ambiguity. The visible symptoms include a growing rate of near-misses, safety violations, and mechanical problems. On the other hand, a decreased rate of fatal accidents may suggest that an increased rate of defects poses no serious threats. Exceeding limits is easier to recognize when several factors — cultural norms, technology, structure — are gradually slipping out of sync than when only one factor is drifting out of alignment.

Although some consequences of exceeding limits — such as excessive stress, components working to their capacities, and recurrent errors — can foretell negative outcomes, these may also be signs of potential positive outcomes. Deviations and errors have served as productive stimuli for innovation, and self-organizing individuals who circumvent limits of existing structures have spawned emergent strategies (Burgelman 1983).

When people or organizations venture outside the envelope of their previous behaviors they experience a sense of reward and achievement. They feel particularly proud when they exceed self-imposed limits, rising above their own expectations and doing what before was unimaginable. Exceeding limits can unfold longitudinally in different feedback-based processes. Success associated with exceeding limits may be self-reinforcing and lead to continuous experimentation, self-efficacy (Bandura 1986), potential improvements, and failures (Starbuck and Milliken 1988). In this case, behavior and exploration persist along a consistent trajectory because of positive feedback and the expectation of continued success. A different dynamic may unfold when individuals and organizations escalate their commitments to failing courses of action (Staw 1976). In this case, negative consequences, or at least ambiguous signals, cause decision makers to commit more resources and to incur the risk of further negative consequences. Although decision makers persist in the hope of accomplishing a turnaround in outcomes, their commitments take organizations beyond their limits if the hopes prove hollow.

There may be benefits even when the consequence of exceeding limits is some kind of failure. Failures and crises can provide valuable lessons, refining the organization's identity, improving its evaluation of capabilities, and stimulating

renewal. Other organizations or divisions may learn from the experiences of organizations that have failed, or they may be able to exploit opportunities created by the failures of their competitors. Thus, competitors such as Apple Computer and Redhat have benefited from the limitations of Microsoft's Windows, and Microsoft itself has tried to overcome some of these limitations. Society can gain from the collective learning from multiple organizational failures, preferably failures that occur in small and inexpensive doses (Wildavsky 1991). Similarly, entrepreneurial activity may benefit societies even when it exacts financial and emotional costs on entrepreneurs (Dosi and Lovallo 1997).

However, exceeding limits can produce undesirable outcomes. It can lead to collapse and irreversible loss of organizational resilience, particularly when limits are inelastic or fixed. Firms may tarnish their reputations by exceeding moral and legal limits, they can suffer major financial losses when pursuing overly ambitious growth, or they can endanger their survival when their business models reaches their limits. Organizations can lose confidence in their abilities and suffer lost business, fines, and law suits. Customers may complain or defect to competitors, whistleblowers make public their worries, suppliers and partners feel overburdened, and regulators and environmental protection agencies and groups issue warnings. Partners, suppliers, and other actors in an organization's ecosystem may feel negative ripple effects (Sheffi 2005). Even when organizations succeed in deliberately exceeding their limits, for example when they innovate, the long-term consequences of that behavior may turn out to be largely negative.

Before they endanger safety, potential limit violations may manifest themselves in activities that seem to relate weakly to safety, such as accounting or research and development. For instance, NASA's financial reporting systems were in disarray several years before the *Columbia* disaster, with the result that the agency had a poor understanding of its costs. This lack of cost knowledge may have fed into some of NASA's decisions about safety. NASA's neglect of the shedding of foam insulation from the external fuel tank illustrates another warning sign: system stress and excessive complexity may reveal themselves in uniform beliefs and the absence of doubt and conflict, as well as in neglect of seemingly minor issues that grow into mistakes. Sometimes, limitations in the formal organization structure may stimulate the development of alternatives that bypass existing arrangements. At NASA, the difficulties engineers faced in communicating critical safety information led to the evolution of informal and self-organizing channels of communication (CAIB 2003).

Signs that organizations are too complex or that existing management approaches have reached their limits may appear at all levels — individual, group, organization, and industry. Turnover, illnesses, cynicism, and confusion may signal excessive stress on workers. Workers may omit important tasks or leave them incomplete, pipelines may dry up, quality may deteriorate, and many components may be very tightly coupled and working to capacity. Signs of impending trouble may include reduced order backlogs, rapid consumption of cash, contracts that are not renewed, and delays in new product delivery. When organizations reach the limits of their existing business or technological models, new competitors and substitute products may appear. In the pharmaceutical industry, the limitations of the Blockbuster model of drug development are

giving rise to a new model of personalized medicine; the emergence of blogs has exposed limitations of traditional media.

Studies of high-reliability organizations say that it is possible to prevent or attenuate limit violations. Roberts and Bea (2001) and Weick and Sutcliffe (2001) have studied organizations that manage to have few accidents even though they operate under very trying conditions. In these settings, deviations from normal usually have negative consequences, and trial-and-error learning is limited, since the first error may be the last trial. Therefore, these organizations prepare for unexpected events by paying more attention to failures than to successes, by avoiding simplicity and by being as sensitive to operations as they are to strategy. These organizations also attempt to respond effectively when limit violations occur; they do so by organizing for resilience and by allowing decisions to migrate to experts no matter where they are located.

What Can Limits Add to Understanding of Organizing?

The authors of this article are certainly not the first people to point to the relevance of limits for human behavior. The *Guinness Book of World Records* has sold more copies than any other copyrighted work. Linear programming is a well known mathematical procedure for finding the most effective ways to utilize resources by pushing some options to their limits. Analysts need a computation technique such as linear programming because it can be very difficult to figure out which resources an enterprise ought to exploit to their limits. One old idea in economics is 'slack', the difference between the maximum plant capacity and the actual capacity in use at this time. Cyert and March (1963) generalized this notion when they described organizational behavior as depending on 'managerial slack', which is the difference between the actual resources a firm is using and the minimum resources it could be using. Several other scholars have subsequently used the concept of slack (Bourgeois 1981; George 2005; Riahi-Belkaoui 1994 1998; Scharfstein 1988).

Nevertheless, limits have attracted less attention from organizational researchers than they deserve. One reason for this neglect may be the difficulty of observing and defining limits. Limits are difficult to observe because they typically involve interactions between organizational and environmental properties, and many people have divergent perceptions of these properties. Various studies have found much disagreement among organizations' members about their organizations and their organizations' environments, and no meaningful correlations between the accuracies of perception and either job experience or specialized training (Mezias and Starbuck 2003). The disagreements among people's perceptions do not arise solely from differences in valid information and expertise. For instance, people with higher statuses have more positive views of their organizations. Thus, higher-status people probably perceive their organizations as having wider limits on their capabilities.

人们认知上的分歧并不仅仅源于有效信息和专业知识的差异。例如，地位较高的人对他们的组织有更积极的看法。因此，地位较高的人可能认为他们的组织对他们的能力有更大的限制

Limits are also difficult to observe because they lurk in concealment. Research about organizations or strategies has focused on current goals for the future or on processes or capabilities that are currently being used to achieve

these goals. Whereas researchers can observe what is currently happening almost all of the time and in almost all situations, limits are not always visible and, when they are visible, they are often visible only for very short periods. As a result, limits do not lend themselves to conventional statistical analyses that focus on averages, because an average cannot represent an extreme value, such as a limit.

部分限制
可能不适用于关注平均值
之类的传统分析

Longitudinal case studies probably afford the best ways to study limits, at least this time. Limits can be computed mathematically with methodologies for defining envelopes around behavior or economic frontiers (Chandra 2002; Grosskopf, Hayes, and Yaisawarng 1992; Reifschneider and Stevenson 1991; Sena 1999). It seems plausible that limit violations initiate strong reactions. If so, limits may evolve in ways similar to fads and fashions (Abrahamson and Fairchild 1999; Carson et al. 2000). However, it is unclear whether limits are idiosyncratic to individual organizations or whether they generalize across classes of similar organizations. Existing case examples suggest that the personalities of senior executives may exert strong influence. It that is so, individual organizations will exhibit distinctive limits.

Limits deserve attention because they complement goals, capabilities, and processes. Limits state that some goals or capabilities are out of reach, some processes impossible, so they frame potential actions and outcomes in realism. Limits also expand horizons beyond the goals, capabilities, and processes that exist momentarily today. Beyond what they are doing today, organizations and people possess ranges of alternative goals and actions. However, to choose goals or actions, people have to know something about the limits of these ranges. Indeed, if an organization is striving to operate near some of its limits, perhaps to maximize profits, its people have to know the limits of several resource ranges.

Limits may provide revealing evidence about organizational and social hierarchies. Most limits depend upon decisions about goals, policies, or resource allocation. Who makes such decisions, and for what reasons? Operations that are well within limits do not demand strong priorities or rationing of resources, whereas operations close to limits force people to make difficult choices. If an organization is striving to operate near some of its limits, it is likely that some people are pushing for extreme performances. Of course, if an organization is striving to exceed some of its limits, some people are pushing for very extreme performances. Who is exerting such pressure, and for what reasons?

Limits also warrant study because limit violations often trigger unintended consequences of human action. Many observers of organizations emphasize the rational and intentional components of behavior. The tendency to use such lenses to interpret behavior is exacerbated because organizational research tends to be retrospective. The focus on limits reminds researchers that, in real time, decision makers' actions face multiple and inconsistent goals, incomplete information, ambiguous feedback, and many potential futures. As a result, intended actions produce outcomes, such as discoveries or accidents, that were unintended or random. This decoupling of actions and outcomes not only complicates rational action in organizations, but also limits the ability of observers — analysts, researchers, regulators, journalists, or members of investigation boards — to assign blame and credit.

限制值得注意，因为它们突出了组织的矛盾本质

Finally, limits deserve attention because they highlight the paradoxical nature of organizations. Organizing at and beyond limits shows the tensions between security and adventure, persistence and change, and pragmatism and romanticism. Both organizations' successes and failures depend on their abilities to exceed only those limits they choose to exceed and to remain within other limits.

组织的成功和失败都取决于他们是否有能力超越他们选择超越的限制，并保持在其他限制内

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