17
The Dominions of Giants

The large public corporation has a distinctive capacity to undertake mammoth, complex initiatives. While institutional funding of VCs has increased their capital, the investments of VC-backed businesses remain smaller and simpler. Nor has control by career professionals suppressed the expansionary tendencies of mega-corporations. Professional CEOs can be less impulsive than freewheeling founders but cannot just serve as caretakers. Stock markets demand and reward growth. As in the preindustrial East India Company, the expansionary impulse of the public company therefore remains powerful.

Yet the dynamism of business behemoths is obscured by the very features that sustain their potency. As we saw in chapter 15, VC firms make more systematic and deliberate investment decisions than business angels and self-financed founders. The systematized routines that help VCs raise more capital and make larger investments also require more information, reducing their tolerance for uncertainty. Similarly with large public companies: for all their professed enthusiasm for de-layering and streamlining, their decision-making remains (as in Chandler's and Galbraith's twentieth-century accounts) procedure-bound and collectivized.

This is not a pathology. Seemingly bureaucratic evaluation and planning routines are both prerequisites for undertaking complex megaprojects and constraints on acceptable uncertainty. If bootstrapped startups are like canoes and VC-financed businesses are catamarans and express boats, large company initiatives are like full-rigged ships with significantly different designs and functions (see Figure 17.1).

That said, the dynamism of large corporations is subtly self-limiting. Unlike VC ownership of private companies, which ends with the time-limited existence of VC partnerships, publicly traded stocks have no expiry date. But the accumulation of successful initiatives tends to produce a debilitating sprawl. Like the East India Company and so many iconic industrial corporations dating back to the nineteenth century that disintegrated or disappeared, overextension—if nothing else—precludes immortality. Overextension also dulls enterprise, contributing to justifiable perceptions of bureaucratic stagnation.

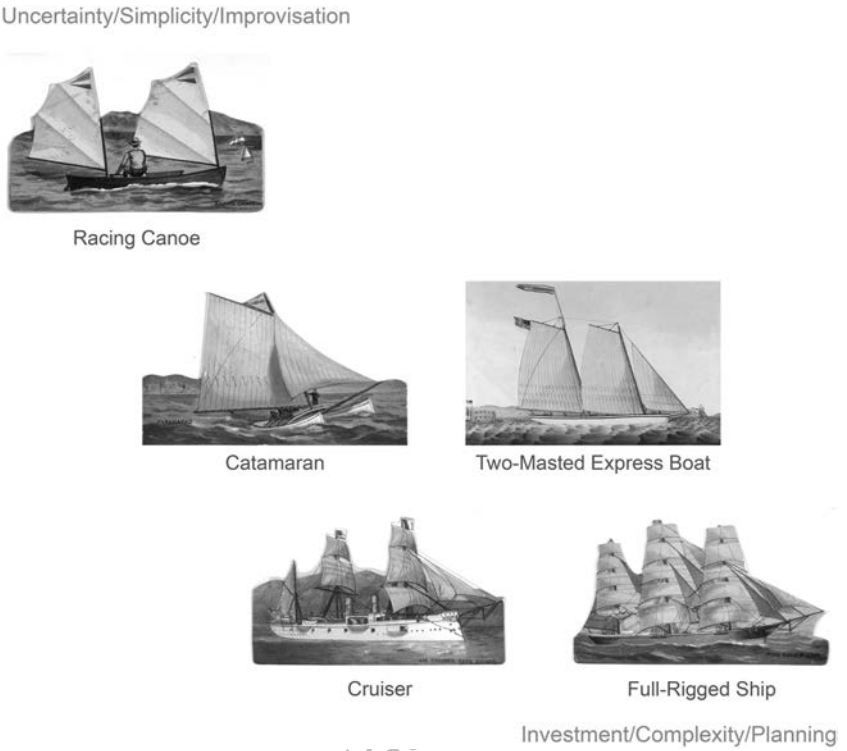

Figure 17.1 Varieties of Vessels (1889)
Source: Compiled from the New York Metropolitan Museum's *Types of Vessels* Series (N139)

My analysis of these distinctive features proceeds through sections that

- Describe the distinctive features of large public company initiatives that have endured into the twenty-first century.
- Explain the interconnectedness of the features—how their decision-making routines and practices influence and reflect the uncertainty, scale, and complexity of the initiatives the corporations specialize in.
- Explore the self-limiting nature of large-company dynamism.

The chapter concludes by recapitulating the main points of Part 3.

1. Enduringly Distinctive Features

Existing Resources As in Galbraith's *New Industrial State*, large public companies mainly use surplus cash from their mature businesses to fund new

initiatives. In contrast, VC-backed firms with no internal funding sources repeatedly raise fresh capital. Young public companies also often raise capital to finance their growth by issuing more stock. But after (and if!) they mature, public companies only issue stock in dire circumstances. In fact, many large public companies retire more stock than they issue.[1]

Stock buybacks do not, however, make large public companies moribund. Even after buybacks, the surplus funds generated by existing businesses allow public companies to invest substantially larger amounts than VCs. In the 2010s the five hundred largest public companies in the United States (ranked by their revenues) collectively spent $2 trillion on R&D and $6.8 tril-lion on their capital expenditures.[2] These outlays amounted to more than ten times the total VC disbursements—which cover more than R&D and capital expenditures—in the 2010s.[3]

Besides cash, large public companies commit the intangible resources of their existing businesses to new initiatives. These include marketing and distribution channels; supplier and customer relationships; technical, financial, legal, and regulatory expertise; employees and recruiting capabilities; and brand names and corporate reputations. The seasoned public company can thus combine the custody of its mature businesses with the sponsorship of new initiatives.

In contrast, VC-backed companies do not generate surplus funds. Even if they did, VCs could not reinvest the funds in their other portfolio companies. The funds initially raised from limited partners therefore cap VC disbursements. VCs also avoid sharing intangible resources—each tub in their portfolio stands on its own bottom.[4]

Size, Complexity, and Uncertainty Public companies with reliable internal funding sources can undertake projects with much larger capital requirements than VC-backed businesses. For example, semiconductor companies like Intel now spend between $10 billion and $15 billion to build semiconductor fabrication plants and more than $4 billion to develop new generations of microprocessors. Boeing spent about $32 billion on its 787 Dreamliner.[5] AT&T, T-Mobile, and Verizon paid $81.11 billion to the US government in February 2021 to purchase spectrum rights for 5G networks.[6] Large pharmaceutical companies spend $1 billion to $4.5 billion to develop a new cancer drug. General Motors budgeted more than $5 billion for the Cruise Origin, the car company's first automated vehicle.[7] The Gorgon Liquified Natural Gas project undertaken in Australia by a consortium of major oil companies cost $54 billion.[8]

The larger projects are naturally more complex than VC or angel-backed initiatives. They support and require a finer division of labor across a broader range of functions and locations. For example, VCs helped the previously angel-funded Starbucks expand from Seattle and other parts of the Pacific Northwest to Chicago and other midwestern cities. A 1992 IPO that raised $29 million helped Starbucks open cafés in New York and other East Coast locations, further increasing the company's geographic scope and operational complexity. In the 2010s, after the coffee retailer had become a large, profitable company, reinvested earnings helped it rapidly expand in China. By 2017, it was opening one new café a day, and by 2018, Starbucks was operating 3,600 cafés in China.[9] Besides café employees, the expansion required knowledgeable local staff for training, developing menus, negotiating leases, marketing, logistics, and so on.

The launches of IBM's personal computer (PC) and Sun's workstation in the early 1980s offer a similar contrast. IBM's historic launch, which made PCs a must-have office appliance, spanned many activities and functions. These included hardware and software design, licensing (of the operating system and the likeness of Charlie Chaplin's character the Little Tramp), development of ISVs (independent software vendors) and office product dealer networks, training and deployment of the in-house sales force, and a national advertising campaign. In contrast, the fledgling VC-financed Sun targeted a smaller, more specialized market. It focused on hardware design, enhancement of the UNIX operating system, and direct sales and support. Sun had no large-scale manufacturing and did not develop a dealer network or mount public relations or advertising campaigns.[10] And like Starbucks, Sun significantly widened its functional and geographic scope after its 1986 IPO.[11]

The complexity has a temporal dimension. Large company megaprojects take many years to complete, sometimes over a decade. After considerable research and planning, Boeing announced its 787 Dreamliner program in 2001. It eventually entered service three years behind schedule in 2011. In 2008, Intel's chief technology officer said the company saw a "clear way" to manufacturing chips under ten nanometers.[12] Expected to ship in 2015, Intel's chips actually began selling in 2019.[13] And just as tasks and activities in one function or location affect those in another, making them collectively "complex," what is done now influences what happens much later.[14] In contrast, funding constraints force bootstrapped entrepreneurs into quick payback ventures, and the exit requirements of fixed-term VC partnerships bound the duration of their projects.[15]

Large companies that undertake complex, long-gestation megaprojects also require evidence supporting the prospects for commensurately large payoffs. In my terminology, the evidentiary requirements limit tolerances for irreducible market uncertainty.

Manifestations of Uncertainty Intolerance

Large companies routinely reject uncertain ideas that VCs, angels, or informally financed entrepreneurs are willing to try out. These include internally generated ideas. Famously, scientists and engineers at the Xerox Palo Alto Research Center (PARC) prototyped local area networks and other computer technologies in the 1970s. In 1979, after Xerox refused to commercialize its local area networking technology, PARC engineer Bob Metcalfe left to cofound a company (3Com) to develop and market Xerox's invention.[16] The same year, visits by Steve Jobs and other Apple employees to Xerox PARC accelerated the use of mouse-pointing devices in Apple's computers.[17]

Large public companies similarly avoid licensing unproven technologies. Stanford University, for instance, attempted to license workstation technology (developed for the **S**tanford **U**niversity **N**etwork project). But established minicomputer producers (Digital Equipment Corporation and Prime, now defunct) decided that the technology had no value. Stanford then assigned the rights to the graduate student who was developing the technology while working on a PhD in computer-assisted design (CAD) tools. The student, Andy Bechtolsheim (who, as mentioned, would later make an angel investment in Google), invested twenty-five thousand dollars of his own money in a prototype and sold licenses to VC-backed startups for ten thousand dollars each. Eventually, Bechtolsheim contributed the technology to Sun Microsystems (which was also VC-financed), where he became a cofounder.[18]

This is not an isolated case: Shane's study of MIT's technology licensing suggests that new firms are more likely than existing firms to license a novel technology.[19] Similarly, Kalamas, Pinkus, and Sachs record that only a third of the deals struck by large pharmaceutical companies to license new drugs from biotechnology companies occur in the preclinical stage. This proportion, they suggest, reflects "the uncertain prospects of deals made early in the development process."[20]

Moreover, uncertainty aversion goes beyond avoiding early-stage technologies and unproven markets. As mentioned, relying on easy-to-imitate ideas and the personal efforts of founders can, paradoxically, make the prospects of promising startups highly uncertain. This kind of mundane uncertainty has also apparently catalyzed "spinouts" from established high-tech employers: According to Klepper, the founders of high-tech spinouts, like the founders of many promising businesses, "begin humbly without very ambitious plans." They leave their employers "out of frustration" after failing to get support for their ideas. These initial ideas are "not very important in determining their long-term fates." Instead, their performance seems to depend

on the "broad experiences of their founders." And employers are indifferent rather than aggrieved: Klepper notes that companies spawning spinouts rarely sue departing employees or challenge them competitively.[21] In my terminology, mundane yet high market uncertainty places the typical spinout outside the zone of interest of established companies.[22]

Strictness and Collectivization Large public corporations use strict, collectivized procedures for evaluating and planning initiatives. Cofounder Gordon Moore's description of Intel's allocation of its R&D budget exemplifies the strictness: "Each product group," writes Moore, "is required to submit a project list ordered in decreasing priority, explain in sometimes excruciating detail why the list is ordered as it is, and indicate where the line ought to be drawn between projects to work on and projects to put off." Only a "small group" tries to "stay abreast with what is going on more broadly in the semiconductor industry," and even this group avoids programs that will generate results only after ten years.[29] Intel's procedures have evolved since Moore's time. But it is a safe bet that as Intel's R&D expenditures have risen from under $2 billion in 1996 to more than $13 billion per year, they have not become less stringent and evidence-hungry.

Although there is no template that all large companies use, their evaluation and planning routines have some common features. According to the 2014 *Oxford Handbook of Innovation Management*, "Most products are developed following a standard sequence of activities, employing tasks and routines that are also fairly standard across different development projects."[30] According to the *Handbook*, these often include funneling many possibilities down to a few product launches. This funnel originates in routines going back to the 1960s, such as NASA's Phased Project Planning, which defined "gates" for reviewing projects: Projects that survive reviews, which include consideration of strategic fit, customer input, and technical feasibility, progress to the next stage of devel-opment. Project teams preparing for reviews commonly hold "mock-up gate meetings . . . to improve their chances to pass gate reviews. Gate reviews are also opportunities to train junior team members and expose them to senior manage-ment thinking."[31]

The process retains the collectivized traditions developed in the twentieth century. According to the Oxford Handbook, it is not just "senior management thinking" that decides the fate of proposed ideas. Product development is a "cross- functional activity involving input from—and creating output for—marketing, strategy, business development, finance, human resources, sales, legal, IT, and many others."[32] Product development teams include "engineers, scientists, supply chain experts, software developers, ad-hoc specialists, designers, marketeers, consultants, and so on."[33] Concepts and designs are also typically reviewed by functional specialists who do not outrank members of

development teams. Outside suppliers may also have a voice. The reactions of potential buyers— secured through systematic techniques, from small focus groups to large-scale market research—play a critical role.

Implementing new concepts and designs likewise entails detailed cross- functional planning and monitoring. Producing and marketing new electric vehicles, cancer drugs, airliners, or the next generation of Windows operating systems and iPhones takes several years and the contributions of tens of thousands of individuals working in several functions and locations. Project, program, and product managers help coordinate these efforts through plans that minutely specify tasks and deadlines. Progress is closely monitored; even minor deviations require multiple approvals and signoffs.

Qualifications Large businesses cannot of course expect proof "beyond reasonable doubt." Contra Galbraith's claim, big company technostructures do not have preternatural powers to divine what customers will want and persuade them to buy what planners had decided would sell. For example, a sweeter, reformulated Coca-Cola was a winner in taste tests, surveys, and focus groups. Actual sales of the reformulation fell far below expectations, and loyalist consumers of the "classic" formula organized boycotts and street protests. Eventually, seventy-seven days after launching its "New Coke," the president of The Coca- Cola Company announced the return of the classic: "The simple fact is that all of the time and money and skill poured into consumer research on a new Coca-Cola could not measure or reveal the depth and abiding emotional attachment to original Coca- Cola felt by so many people."[23]

Data- driven, data-rich digital behemoths also struggle to develop what will sell. In 2014, Facebook paid about two billion dollars to acquire Oculus, a maker of virtual reality headsets.24 By 2022, the company had spent about one hundred billion dollars on R&D for the "metaverse"—a 3-D virtual world[25]—and renamed itself Meta Platforms. Disney, Microsoft, and Walmart also foresaw huge possibilities in virtual products and services. The rebranded Facebook, whose core offering has nearly three billion monthly active users, set a modest goal of five hundred thousand monthly active users for Horizon Worlds, its flagship metaverse product, by the end of 2022. By the spring of 2023, Horizon Worlds had well under half its modest target of active users, and the company had stopped marketing the metaverse to advertisers. Microsoft had also closed its virtual workspace platform, and Disney and Walmart had ended their meta-verse projects.[26]

Pharmaceutical companies face the whims of nature. The development of a new antibiotic, for example, usually takes about a decade and can cost more than half a billion dollars. But rapidly mutating bacteria can become resistant to new drugs long before developers can earn back their investments.

Similarly, drugs that pass safety tests in clinical trials can produce unacceptable side effects in widespread use, sometimes discovered after decades. Ranitidine, marketed as Zantac, was until recently considered an effective antacid used to treat diseases such as peptic ulcers. The World Health Organization included the drug, introduced in 1981, in its list of essential medicines. US pharmacies filled over eighteen million prescriptions for over four million patients in 2018.[27] In 2019, however, a probable carcinogen was discovered in ranitidine products, which were withdrawn from the US market in April 2020.[28]

The possibility of drug resistance or the discovery of new side effects are not unknown unknowns. They are predictable unpredictabilities. The fallibility of market research is also well known. But a sure thing or even a nearly sure thing standard would make any investment or new initiative impossible. And while mature, professionally managed corporations have higher demands for justificatory evidence than young, founder-controlled businesses, they cannot eliminate even simple Ellsberg-style "missing information" uncertainty. Imagined possibilities that go beyond the observable evidence are inescapable. Only the groundedness of justifications varies.

Not Entirely Impersonal Just as large corporations have low but not zero tol-erance for missing information, their procedures for evaluating new initiatives are not algorithmic or formulaic. The distinction between procedures for "oper-ating" and "enterprising" choices is notable. Operating rules— using computer- generated credit scores to issue credit cards, for example— can be rigidly formulaic. Enterprising routines, which include interpreting ambiguous contextual data, aim for "procedural rationality" (per Simon, chapter 9), not substantive invariance.

While large company routines require heavy weights of evidence (Keynes, chapter 8) they also include subjective interpretations of the evidence and at least some leaps of faith. Even in the pharmaceutical industry, there is room for opinion, judgment, personal relationships, and forceful personalities to override bald facts and rigid protocols.

Personal Relationships and Personalities

As briefly mentioned (chapter 2), Eli Lilly's blockbuster drug Prozac had in-itially failed to outperform a placebo in clinical trials. When the trial was re-peated on patients who had responded to other tranquilizers, it outperformed a placebo. And this was not the first hole Prozac—"fluoxetine"—had climbed out of. Lilly's researchers had previously encountered skepticism at scientific conferences when they presented the results of animal studies. Lilly's internal committees ignored the skepticism.

Later, safety studies on rats and dogs had shown a rapid increase in fatty acids—a potentially risky side effect. The project was suspended but then (with the encouragement of the FDA) allowed to continue. It was hoped that fluoxetine might avoid the side effects in humans that it produced in animals. And indeed, it did not create the side effects. However, it did fail its initial efficacy tests in human trials, yet the fluoxetine team persuaded Lilly's management to redo the trial with a different design.

Why did Lilly's management keep supporting the project?

The personal relationships and reputation of Robert Rathbun, a key re- searcher on the fluoxetine project, may be one reason. Rathbun and Irwin Slater, both pharmacologists at Lilly, had once worked on a groundbreaking treatment for high blood pressure. Lilly later promoted Slater to director of pharmacological research, responsible for managing the fluoxetine project. Thus, the technical advocate had a natural managerial ally.[56]

Imperial Chemical Industries (ICI) development of tamoxifen, now a gold-standard breast cancer treatment, provides another example. UK- based ICI had attempted to develop tamoxifen as a contraceptive and as a cancer treatment. It failed as a contraceptive in clinical trials, and although it showed modest promise for cancer treatments, ICI's board of directors nearly stopped development. Arthur Walpole, a thirty-four-year ICI veteran who led the tamoxifen project, threatened to resign. He then persuaded his bosses to market tamoxifen as a palliative treatment for patients with terminal breast cancer in the United Kingdom and to sponsor human trials in the United States.[57]

Source (with detailed citations): Bhidé, Datar, and Stebbins 2021a; 2021b

2. Explaining Interconnected Distinctiveness

Simple Inferences and Extensions Strict (but not totally inflexible) routines with high demands for objective evidence directly reduce tolerances for market uncertainty, while collectivization does so indirectly. The indirect relation-ship between collectivization and uncertainty intolerance is implicit in my arguments (chapter 15) about VC- backed businesses: undiscoverable information increases guesswork, the role of prior experiences and predispositions, and potential disagreements. Giving many individuals with diverse expertise and job assignments (not just direct bosses) a say makes agreement particularly difficult. Therefore, initiatives supported with objective information are more likely to progress through the development funnel— and are more likely to be proposed than high-uncertainty projects that face quick rejection. [36]

Strict evaluation routines also help explain preferences for large projects: ceteris paribus, projects with lower capital requirements produce less profit and are less likely to justify high evaluation costs. Similarly, large companies' planning and monitoring capabilities are more valuable in undertaking large, multiyear projects.[37]

But why do large companies establish such elaborate and collectivized routines rather than use the more streamlined procedures of VCs and nimble pre-IPO businesses? Why did companies like General Motors, with reputations for obedient deference to organizational rank, also develop traditions for consensual decision-making? And why do high-tech companies that claim to detest bureaucracy adopt these collectivized practices as they mature? These questions do not arise in economic models focusing on information asymmetries and misaligned incentives (chapter 7). As mentioned, the models usually exclude uncertainty, honest mistakes, and genuine differences of opinion. Bosses establish optimal incentives and monitor subordinates to control self-serving conduct.

Routines do play an important role in Nelson and Winter's heterodox evolutionary theories. They assume that large organizations rely on routines because their scale and complexity make it impossible for top management to "direct or observe many of the details of the organization's functioning."[38] But reasons for consensus favoring routines (and their relationship to uncertainty and resource requirements) are outside what Nelson and Winter seek to explain.

Diffusion of Stockholders and Knowledge Fama and Jensen's hypotheses, which I used in chapter 15, again provide a good starting point for understanding the "functional rationality" (chapter 9) of large company routines.

Fama and Jensen argue that large companies separate decision management (proposing and implementing decisions) from decision control (ratifying and monitoring decisions). The separation, they claim, reflects two kinds of diffusion. Ownership is diffused across many stockholders, and "valuable specific knowledge" is diffused across many employees.[39] Both help large companies take advantage of economies of scale, but they also amplify decision management and decision control problems.

Tiered delegation reduces these problems. At the apex, boards of directors exercise decision control on behalf of diffused stockholders: They ratify and monitor the organization's most important decisions and hire, fire, and compensate the top executives. Below, a "decision hierarchy" helps utilize "decision skills throughout the organization." Bosses review and ratify their subordinates' "decision initiatives" and, in turn, submit their proposals for ratification by their superiors.[40] This arrangement allows boards and top executives to delegate decisions to subordinates they cannot directly supervise.[41]

Fama and Jensen's hypotheses allow bottom-up initiatives without the emasculating hard rules of Harvard economist, Jeremy Stein's model.[42] Although they focus on the prototypical agency problem of misaligned incentives,[43] the mechanisms Fama and Jensen analyze readily extend to controlling misjudgments and explaining uncertainty aversion. (Proposals supported by more evidence are more likely to get the boss's attention and approval.)

But puzzles about public company routines remain. VC-backed pre-IPO businesses and up-and-coming public companies also have boards of directors.[44] They too "partition and delegate" decision functions to decision hierarchies. Why are evaluation routines much more thorough in mature public companies? Why do they use widely diffused, multifunctional evaluators alongside "decision hierarchies"? Why, in other words, are large company routines for evaluating, planning, and monitoring projects so costly, clumsy, and slow—and so uncertainty averse?

My explanations below rely on governance and coordination problems that I argue are more acute in mature public companies.*

* The main building blocks exist in the Fama and Jensen papers, the business histories reviewed in the last chapter, Galbraith's book, and much other economic, legal, and management research. But for brevity I combine a high-level restatement of well-known prior ideas with some modest original extensions without attempting to untangle the two.

Governance Problems Diffused stockholding poses well-known governance problems in large public companies. In principle (and in the Fama and Jensen model), independent boards of directors, representing public stockholders, "direct" top managers. In practice, the independent direction is perfunctory. As Galbraith pointed out, executives control board nominations. The election of official nominees is usually automatic and Soviet-like. No domain expertise is necessary and may even disqualify.[45] Additionally, as Warren Buffett points out, handsome fees for modest effort discourage directors from asking tough questions.

Warren Buffett on Board Independence

"Director compensation has now soared to a level that inevitably makes pay a subconscious factor affecting the behavior of many non-wealthy [board] members. Think, for a moment, of the director earning $250,000–300,000 for board meetings consuming a pleasant couple of days six or so times a year. Frequently, the possession of one such directorship bestows on its holder three to four times the annual median income of US households. . . .

"Is it any wonder that a non-wealthy director ('NWD') now hopes—or even yearns—to be asked to join a second board, thereby vaulting into the $500,000–600,000 class? To achieve this goal, the NWD will need help. The CEO of a company searching for board members will almost certainly check with the NWD's current CEO as to whether NWD is a 'good' director. 'Good,' of course, is a code word. If the NWD has seriously challenged his/her present CEO's compensation or acquisition dreams, his or her candidacy will silently die. When seeking directors, CEOs don't look for pit bulls. It's the cocker spaniel that gets taken home."

Source: Berkshire Hathaway Inc. 2019 Annual Report, 13.

In contrast, VCs serve on the boards of the companies they invest in—unlike the shareholders of public companies, they do not rely on kind strangers for oversight. VCs specializing in markets and technologies can provide more thoughtful direction than the titular and often inexpert overseers of public companies. And VCs don't join boards for board fees. They aim to maximize their "carried interest" through profitable exits and to build reputations as good VCs so that they can continue raising new funds as their existing partnerships terminate (chapter 15).

Moreover, the governance problems of public companies become more acute as they mature. Initially, founders and founding families with a strong interest in the success of the enterprise often own large blocks. But the blocks naturally

dissipate as founders (and their heirs or charitable foundations) divest their holdings. Concurrently reinvested earnings in new initiatives increase the complexity of the enterprise and, thus, the difficulties of oversight.

Giving top executives "high-powered incentives" ("pay for performance") through stock options and bonuses is not a panacea. Without effective director oversight, incentives can encourage executives to recklessly "go for broke." Additionally, even if options and bonuses effectively align the monetary interests of executives and shareholders, they do not solve the problem of managerial misjudgment. In large public companies, these problems can be severe. As Peter Lynch, the former manager of Fidelity's Magellan Fund, once joked, "I only buy businesses a fool could run, because sooner or later one will."*

Strict evaluation and planning routines comfort investors like Lynch that a "fool could run" the business if necessary. The routines—and their innate uncertainty aversion—also restrain CEOs from undertaking reckless initiatives. Of course, some CEOs exercise their positional authority to override standard procedures. As of this writing, corporate bigwigs are opening the spigots for any and all artificial intelligence investments. But as Galbraith pointed out fifty years ago, "technocracies" place severe limits on the discretion of bosses.

That said, controlling the misjudgments of top executives is an ancillary benefit of intricate, collectivized routines rather than their aim. Instead, Chandler's historical accounts of managerial "structures" and Galbraith's analysis of technostructures (reviewed in the last chapter) suggest that the direct purpose of the routines is to control coordination problems.

Coordination Problems As mentioned, large companies have advantages in funding and orchestrating large, complex initiatives that coordinate specialized functions and experts to create products with many valued attributes. Even in a capitalist market, organizations cannot rely just on market prices to achieve this coordination.† If this were possible, the raison d'être for the large corporation would disappear.

* Note that Lynch's quip, refers to fools, not knaves. Also recall Napoleon's dictum mentioned earlier.

† While Hayekians and other economists praise market prices for coordinating independent agents, their examples focus on what has become a small part of modern economic activity. They claim that prices align the supply and demand for commodities like copper and coordinate the production of near-commodities like pencils. Relying on prices (or spontaneous order) to plan and coordinate development of new drugs, software, or airplanes is unheard of, however. High capital costs and complex technologies limit the role of price signals, even in commodity production. High copper prices may encourage metal producers to consider a new mine or smelter. But no sensible copper producer will invest in new capacity without extensive market research to assess long-run prices and demand. And prices play, at best, a modest role in the design and commissioning of a new mine or smelter.

Partitioning complex initiatives into chunks undertaken by dedicated teams is a helpful but only partial solution.[46] In principle, partitioning enables a Hayekian decentralization of decision-making without placing an implausible burden on market prices to align decentralized choices. In small teams, everyone can easily know what everyone else is doing or planning. If necessary, the team leader can dictate the alignment of their joint efforts.

In principle, the work of each team is mainly self-contained; to the extent it is not self-contained, organizations can efficiently secure alignment using a tree structure.[47] With a tree, everyone does not have to coordinate with everyone else—or even each small team with every other small team. Instead, the "leaves" can communicate through their twigs and branches.

Partitioning can also allow a "design chief" to provide "conceptual integrity," leaving numerous others (organized into trees) to implement. The problem of the camel as a "horse designed by a committee" is thus avoided, creating a cohesive, usable product with well-coordinated functions.

Brooks on Conceptual Integrity

In his classic, *The Mythical Man Month* (1975), Frederick Brooks, the architect of the IBM 360 system, argues that "most programming systems reflect conceptual disunity" arising from "the separation of design into many tasks by many men."[48]

Brooks contends that "conceptual integrity is *the* most important consideration in system design. It is better to have a system omit certain anomalous features and improvements, but to reflect one set of design ideas, than to have one that contains many good but independent and uncoordinated ideas."[49] And "conceptual integrity dictates that the design must proceed from one mind, or from a very small number of agreeing resonant minds."[50] You cannot get design integrity from a committee, Brooks asserts.

"Schedule pressures, however, dictate that system building needs many hands." And one "powerful way" of "getting conceptual integrity on very large projects" is to separate "architectural effort from implementation."[51]

There is however a practical catch. Partitioning by an omniscient being would be ideal in an uncertainty-free universe. Real-world uncertainties impose severe limitations, however. Consider Brooks's recommended separation of operating system architecture (which he defines as the "complete and detailed specification of the user interface"[52]) from its implementation. Lacking omniscience, the architect responsible for the conceptual integrity of the user

interface must guess what users require and what implementing teams can deliver. And a frontline salesperson or engineer may know of a crucial fact that the architect does not. Yet vertical partitioning may prevent the salesperson's or engineer's knowledge from reaching the architect. Conversely, frontline implementors can misinterpret the architect's grand design, undermining the "conceptual integrity" of the system.[53]

Horizontal specialization poses further alignment and information sharing problems. For example, operating systems combine several components, including user interfaces, command interpreters, file management modules, process management components, networks, memory, storage, input/output devices, and security measures. Designing these components requires a wide range of expertise including knowledge of assembly and machine language, biometrics and accessibility design, documentation and knowledge management, industry-standard interfaces, and communication protocols and FCC regulations.

Organizing teams to develop and integrate the components of such complex systems involves trade-offs. Small teams may easily achieve "internal" coordination through direct communication between co-located team members. But coordinating across many small teams is more challenging. Yet, if what the teams produce doesn't mesh, the entire system can crash.*

In some celebrated cases, seemingly trivial misalignments that caused systemic failure have been hard to identify even after the fact. An O-ring seal that could not tolerate freezing temperatures caused the 1986 space shuttle *Challenger* disaster. It took a blue- ribboned Presidential Commission to establish the mis-match between the O-ring specifications and launch conditions as the cause.[54]

These coordination problems are absent or minor in the simple initiatives undertaken by self-or informally financed ventures, as mentioned. In 1973, software programmer Gary Kildall personally created CP/M, the first operating system for personal computers. But early versions of CP/M, like the early personal computers, were rudimentary. For example, they merely supported single-tasking on 8-bit microprocessors and no more than 64 kilobytes of memory and did not work with hard drives.[55] Similarly, Bob Frankston and Dan Bricklin programmed VisiCalc, the pioneering spreadsheet, by themselves. Frankston wrote the code at night, which Bricklin tested and debugged by day. Again, while Bricklin's conceptualization of the spreadsheet was pathbreaking, VisiCalc, which also initially ran just on 8-bit computers, had far less functionality than today's Excel. No separation of architecture and implementation was required for its development.

* Alignments with outside groups and circumstances can also be critical. Operating systems must work with externally developed devices (such as printers and displays), applications (including games and productivity software), and users' "cloud" and "on-premises" servers. They must also conform to rules for Wi-fi communications and privacy and conventions for accessibility.

To summarize: Complex high-stakes initiatives, such as the Windows operating systems and Office 365— with their many possibilities for costly misalignments—impel large public companies like the 2020s Microsoft to use comprehensive, collectivized evaluation, planning, and oversight routines. The routines go far beyond Fama and Jensen's (and Knight's RUP) decision hierarchies, sometimes frustrating founder-CEOs like Jeff Bezos, under whose watch they evolve. The routines evaluate the strategic soundness of proposals and their tactical details—far beyond anything necessary to control slacking or stealing.* They typically are set in pyramidal tree structures but include horizontal intersections (such as committees, task forces, and councils) and positions (such as product and program managers) with multiple bosses.

Strict routines that reduce internal coordination problems unintentionally reduce tolerances for external market uncertainties about customers, competitors and technologies. Reciprocally, low market uncertainties increase the reliability of plans and routines to control misaligned responses to external changes. Large companies cannot however eliminate uncertainty—a Knightian precondition for profit—or function like a Weberian bureaucracy.

Officials in Weber's idealized bureaucracy have duties and rights within a "specified sphere of competence" and make decisions "according to calculable rules."[56] Although bureaucratic procedures can impede "the discharge of business in a manner best adapted to the individuality of each case," Weber argued that in its perfectly developed form, bureaucracy eliminates "love, hatred, and all purely personal, irrational and emotional elements which escape calculation."[57]

But procedures for evaluating new commercial initiatives cannot disregard "the individuality of each case." and consideration of individuality inevitably requires at least some subjective judgments that "escape calculation." Dynamic giants somehow develop routines that leave room for such judgments. The routines do not however allow mega-corporations to grow indefinitely. As we see next, routines that support the expansion of large public companies eventually deaden their dynamism and ultimately threaten their very existence.

3. Self-Limiting Dynamism

Expansionary Impulses Jensen's 1989 *Eclipse* article attributed large-scale reinvestment of public company profits to anti-shareholder policies of top managers, as mentioned in the previous chapter. Additionally, Jensen claimed that "the

* As one Amazon project manager observes, "Let's say you want to tweak an API [an interface through which software programs communicate]. That might be a 2-line code change, which at a startup, would be deployed in a few days. At Amazon, that will take 6–7 weeks, even if I have 20 major enterprise customers who all want this change and agree on it. Amazon can't afford mistakes, so everything has to go through 4– 5 layers of approval before you can get it done" (Iyer, 2020).

tendency of companies to reward middle managers through promotions rather than annual performance bonuses also creates a cultural bias toward growth. Organizations must grow to generate new positions to feed their promotion-based reward systems."[58]

But as Warren Buffett points out, Edgar Smith's 1924 book, *Common Stocks as Long-Term Investments*, had come to the opposite view about reinvestment. Buffett quotes from John Maynard Keynes's review of Smith's 1924 book:

> I have kept until last what is perhaps Mr. Smith's most important, and is certainly his most novel, point. Well-managed industrial companies do not, as a rule, distribute to the shareholders the whole of their earned profits. In good years, if not in all years, they retain a part of their profits and put them back into the business. Thus *there is an element of compound interest* (Keynes's italics) operating in favour of a sound industrial investment. Over a period of years, the real value of the property of a sound industrial is increasing at compound interest, quite apart from the dividends paid out to the shareholders.

Buffett continues, "Though investors were slow to wise up, the math of retaining and reinvesting earnings is now well understood. Today, school children learn what Keynes termed 'novel': combining savings with compound interest works wonders."[59]

But compounding requires reinvestment. Therefore, Buffett and his partner Charlie Munger have "long focused on using retained earnings advantageously." And with 99 percent of Buffett's one-hundred-billion-dollar-plus net worth held in Berkshire Hathaway stock, this reinvestment policy is unlikely to be anti-shareholder. In other large public corporations, too, stockholders prefer reinvestment; they do not see professional managers as mere harvesters of vineyards that an entrepreneurial founder planted.

Contra Jensen, middle managers—and other employees, regardless of rank—do not push top executives of public companies for growth merely because of dysfunctional "promotion-based reward systems." As HP's David Packard wrote in his memoirs, he and cofounder Bill Hewlett concluded that "continuous growth was essential" because their company "depended on attracting high caliber people" who demanded "ample opportunity for personal growth and progress."[60]

Complementary Assets To slightly repurpose the biblical parable of the Talents, stockholders of the modern public corporation are like the master who condemned the "wicked and lazy" servant for merely maintaining assets entrusted to the servant's care.[61] Like ambitious employees and customers, they expect enterprising leadership, not stewardship of the status quo.

Conditions apply, however.

The corporation must have a robust system for evaluating, planning, and monitoring investments, as mentioned. Stockholders in public companies typically do not trust just the talents of the top managers. Investment geniuses like Warren Buffett and Charlie Munger, whose track records speak for themselves, are exceptions.

Moreover, just as a frigate's steering and navigational systems aren't simply scaled-up versions of a catamaran's, acceptable routines in a large public corporation aren't scaled-up versions of the routines that support a VC- or angel-financed business.[62] Inevitably, acceptable routines are cumbersome and impose high demands for supporting evidence. This can delay entry into rapidly growing markets, allowing nimbler rivals to establish first-mover advantages. Yet investments made after most uncertainties have already been eliminated—except by geniuses like Buffett—cannot produce attractive returns.

Synergies with established units can compensate for the delays. Using the intangible resources of existing businesses—and not just their cash flows—to develop new products and enter new markets ("related" diversification) has well-known benefits. For example, using existing sales forces and customer relationships can reduce the cost and difficulty of launching new products. It can also improve the cost-effectiveness of the existing sales forces, increasing profits. Business units serving different users can also benefit from shared capabilities, such as R&D labs. And expanding into related businesses concurrently uses the expertise of existing staff and gives them opportunities to acquire new skills and experiences.

Crucially, synergies allow existing businesses to enter markets after uncertainties about demand and technologies have fallen to tolerable levels. In industry after industry, we can see examples of established companies leveraging their existing resources to catch up and overtake the pioneers. These include IBM in mainframe and minicomputers; General Electric and Siemens in Computed Tomography and Magnetic Resonance Imaging; Microsoft in spreadsheets, word processing, and user-friendly operating systems; and Google in web-based email and mobile telephone operating systems. Similarly, pharmaceutical giants routinely acquire or license products from small biotech companies. Using their sales and marketing capabilities justifies paying nosebleed prices for the products—and escaping the technological uncertainties of early-stage development.

Coordination Constraints As the case of Barnes & Noble shows, existing resources cannot ensure successful catch-up.[63] The "relatedness" of new initiatives can also increase alignment uncertainties and coordination problems. "Cross-selling" new products to existing customers can backfire. The successful introduction of a low-cost product can reduce the sales of existing products with

higher profit margins, while a defective new product can erode customer loyalty. Existing channels may also lack the capacity to cross-sell. While Starbucks and some drugstore chains have successfully used their cafés and retail stores to sell packaged food, Sears's attempt to sell "socks and stocks" flopped. Promoters of new initiatives may, therefore, favor hiring their own sales personnel who will learn how to overcome buyers' misgivings about new products.

Conversely, managers and other staff of existing businesses, worried about reduced sales—and the diversion of their cash flows—may veto initiatives in adjoining or related markets.[64] Therefore, the routines and existing resources that once enabled expansion can later obstruct the growth that stockholders and ambitious employees continue demanding. And the more successfully and broadly the corporation has previously expanded its scope, the greater the obstacles.

Big Blue's Blues

IBM developed its system of collective decision-making during the 1950s and 1960s when it faced the "critical problem" of building consensus between engineers and marketers.[65] Frank Cary, an IBM executive, testified (in a 1969 antitrust trial) that IBM had developed an organization "based on checks and balances, which provide a structure to insure [*sic*] the representation . . . of staff, line, product division, subsidiaries and headquarters viewpoints." Cary (who later served as the company's CEO) emphasized the role played by twenty-five hundred staff officers in planning new products: they had to understand the product and the marketplace and present proposals that had "been reviewed, and checked and balanced against Manufacturing, Engineering, Service, [and] both the Domestic and the World Trade Marketing Divisions, before they c[a]me forward to have it further reviewed by the Corporate Staff and the Management Review Committee."[66]

The system helped solidify IBM's global dominance in mainframe hardware, software, and peripherals and, in the 1970s, to catch up in the minicomputer market that the Digital Equipment Corporation had created. By the 1990s, however, IBM's routines became paralyzing, according to Cringely:

> Every IBM employee's ambition is apparently to become a manager, and the company helps them out in this area by making management the company's single biggest business. IBM executives don't design products and write software; they manage the design and writing of software. They go to meetings. So much effort, in fact, is put into managing all the managers who are managing things that hardly anyone is left over to do the real work. This means that most IBM hardware and nearly all IBM software is written or designed by the lowest level of people in the company—trainees. Everyone else is too busy going to

> meetings, managing, or learning to be managers there is little chance to include any of their technical expertise in IBM products. . . .
>
> IBM has layers and layers of management to check and verify each decision as it is made and amended. The safety net is so big at IBM that it is hard to make a bad decision. In fact, it is hard to make any decision at all, which turns out to be the company's greatest problem and the source of its ultimate downfall (remember, you read it here first).[67]

This biting and undoubtedly embellished 1992 account was prophetic. The once dominant computing giant had a near-death experience and only survived after radical retrenchment that reversed decades of prior expansion.

Illusory Resolution Conglomerates seemed to sidestep the coordination problems of related diversification and the deadening reactions they evoked. According to Chandler, conglomerates had "appeared on the American business scene" in the 1960s as a "major variation of the diversified, multidivisional enterprise." Previously, the "large, diversified enterprise had grown primarily by internal expansion—that is, by direct investment of plant and personnel in industries related to its original line of products. It moved into markets where the managerial, technological, and marketing skills and resources of its organization gave it a competitive advantage. The conglomerate, on the other hand, expanded entirely by the acquisition of existing enterprises, and not by direct investment into its own plant and personnel, and it often did so in totally unrelated fields."[68]

Instead of orchestrating synergies across disparate businesses, conglomerates ran internal capital markets, transferring funds from units that did not have profitable reinvestment opportunities to those that did. Oliver Williamson constructed a theory for the advantages of internal capital markets, providing intellectual legitimacy to the form, while consulting firms like the Boston Consulting Group created tools (like the "growth-share" matrix) for their management. And stock markets encouraged conglomerates by valuing their stock for more than their constituent parts.

The advantages crumbled in the 1980s. Studies suggested that unrelated diversifiers produced worse returns on capital than related diversifiers and focused firms. Academics questioned the benefits of internal capital markets.[69] Stock markets imposed steep "conglomerate discounts," valuing conglomerates for much less than their constituent units. Discounts, in turn, attracted raiders seeking to profit from breaking up conglomerates.[70]

Change and Continuity Galbraith's older New Industrial State giants also retreated, along with the beleaguered 1960s conglomerates. Belying Galbraith's assertions of their invulnerability, the giants went bankrupt or were sent off to private equity firms for disassembly and repair. Soon, few will remember shopping at Sears or A&P. Flying Pan Am or Eastern Airlines is already a distant memory. Even some large corporations that gained prominence after the publication of Galbraith's 1967 book, such as HP and Intel, are struggling.

But giant corporations have not become extinct or irrelevant. At the end of 2023, the ten highest- ranked US corporations in terms of market value accounted for about 26 percent of the total value of listed US stocks (see Table 17.1). Apple alone accounted for nearly 6 percent.[71]

And as the life stories of today's top giants indicate, entrances and exits from the top ranks have quickened. Eight of the 2023 top ten were formed in or after the mid- 1970s.[72] Only one (Microsoft) was in the top ten at the start of 2000.[73]

The new giants have risen swiftly into the top ranks through both internal expansion (like Apple's development of the iPhone) and acquisitions (such as Google's acquisition of YouTube and Meta/ Facebook's acquisition

Table 17.1 Top Ten US Public Companies Ranked by Market Value, December 31, 2023

Rank	Company	Market Value ($ billions)	Year Founded	Year of IPO
1	Apple	2,994	1976	1980
2	Microsoft	2,795	1975	1986
3	Alphabet (Google)	1,756	1998	2004
4	Amazon	1,570	1994	1997
5	Nvidia	1,223	1993	1999
6	Meta (Facebook)	910	2004	2012
7	Tesla	790	2003	2010
8	Berkshire Hathaway	777	~1955	~1965
9	Eli Lilly	553	1876	1952
10	Broadcom	523	1991	1998
	Total	13,368		

Note: (1) The total value of 9,148 companies listed in US markets at the end of 2023 was $50,467 billion (Source: Bloomberg). (2) Berkshire Hathaway originates in a textile manufacturing company established in 1839 as the Valley Falls Company. (3) Broadcom includes a business started within Hewlett Packard in 1961.

of Instagram). Chandler's older multidivisional giants relied mainly on internal development. A growing appetite for "long-tailed" investments in private and public markets has directly or indirectly financed rapid expansion. Tesla, for example, raised over $60 million from VCs and other private investors from 2004 to 2010,[74] $226 million in an initial public offering in June 2010, and about $4.5 billion in stock and bond issues in the following six years.[75] And indirectly, the giants have benefitted from acquiring companies like YouTube and Instagram that VCs and other private investors had already helped build up.

New technologies, know-how, and experienced talent have supported rapid growth by helping to control coordination problems. These include goal-alignment protocols (like OKRs) and project management techniques for developing new products, customer relationship management and logistics software, and a cadre of professionals who have managed rapid growth and the integration of acquired companies.

Yet in meaningful ways, the new giants have followed classic patterns. Their journeys have been serendipitous, with many unexpected twists and turns. When Gates and Allen started Microsoft, they could not have known that an operating system would be the cornerstone of their dominance in personal computer software. Steve Jobs could not have known that Apple's iPhone revenues would be five times its revenues from personal computers. Jeff Bezos could not have anticipated that Amazon would buy a robotics company in 2012 and, in 2014, start a cloud services business that would generate over $80 billion in revenues by 2022.[76] And initially, Google's founders had not worked out how they could monetize their search engine—they had "ruled out banner ads or pop-up ads, the standard ways in which websites earned money."[77]

The giants have also typically progressed—through some exceptional combination of entrepreneurial capacity and luck—from informal or self-funding, to angel finance, to VC, to public markets. And access to more capital and other intangible resources has encouraged larger and more complex initiatives. But giant businesses that somehow made the difficult passage from inception to maturity cannot grow to the sky. Nor can they cease to grow. Inevitably, today's giants will succumb to self-made unmanageability even if their core businesses withstand Schumpeter's "waves of creative destruction" or Christensen's disruptive innovations.

Review of Part 3 and Preview of Part 4

Routines have played a central role in this and the earlier chapters on specialization, with their strictness connecting the uncertainty (extent of doubt-producing

missing information), investment requirements, and complexity (including temporal complexity) of one-off entrepreneurial initiatives. Textbook microeconomics (and Knight's book) exclude routines. Routines are implicit in the Sah and Stiglitz papers comparing decentralized polyarchies and hierarchies and in the Fama and Jensen papers on organizational forms. But these papers do not explain how routines work; they merely treat routines as black boxes that model what they produce. Some old behavioralists—prominently, Simon and Nelson, and Winter—explicitly gave decision-making routines a central role. But they also modeled routines mechanistically, often through computerized algorithms.

I have emphasized the rich forms and designs of routines (as in Table 3.1) and their incorporation of subjective human judgment. So far, however, I have focused on the consideration of objective justificatory evidence. In reality, organizational routines—and other collective routines such as jury deliberations—involve more than just consideration of evidence. Routines evaluate and help construct imaginative yet plausible interpretations ("meanings") of what is, was, and could be. The next and penultimate part of my book analyzes imaginative interpretations of uncertain entrepreneurial possibilities, typically produced through discourse.

Economists, including those studying entrepreneurship and innovation, do not pay much attention to constructive, imaginative discourse. In textbook microeconomics (and heterodox "Hayekian" theories), market prices, not humans, do the talking. This talk is presumptively efficient, whereas information economics and agency theories stress the distortions arising from concerns about lies.

In the old Simon-style behavioral economics (chapter 9), discourse operates invisibly, behind the scenes. It has no suggestion of imagination or emotion. It is telling that Simon modeled the mind as a computer. K-T–style behavioral economics (chapters 9 and 10), like information economics and agency theory, focuses on problems of misrepresentation but with a twist: markets fail because people can be manipulated and not because they presuppose dishonesty. And in recent behavioral finance, emotion-stoking rumors cause wild fluctuations in markets. Here, too, discourse does not promote constructive exchange or enterprise.

Yet, outside economics, discourse has long been a significant subject for systematic study. The study of rhetoric and literature goes back to antiquity. The current discourse-related scholarship, like the practical advice on the topic, is vast and disparate. And for my purposes, this is a double-edged sword. The vastness potentially provides much material to mine. But its disparateness—and the absence of a cohesive economics-like paradigm—makes any practical synthesis challenging.

And now a spoiler alert for Part 4: As we will see, psychologist Jerome Bruner's work helped me navigate the disparateness of entrepreneurial discourse and identify its key features. Bruner's work also altered my views about entrepreneurial storytelling. I had long thought of entrepreneurial pitches and proposals as stories. I still see significant storytelling elements in such pitches and proposals: they use imagined details, sequences of events, and evocative metaphors (chapter 19). But I have now come to recognize (chapters 20 and 21) that entrepreneurial proposals and plans lack crucial elements of a "proper" story, such as unexpected reversals of fortune. Instead, proper stories play a supporting role in imaginative entrepreneurial discourse: they are not the show's stars.