Enterprise Architecture

Vol. 13, No. 5

Executive

CUTTER CONSORTIUM

The Art of Change:

Fractal and Emergent

by Ruth Malan and Dana Bredemeyer

This *Executive Report* explores the role of enterprise and other architects in highly adaptive, innovative, and agile organizations. We consider the pressures on organizations to master the art of change and present a fractal metaphor for the tandem role of strategy and architecture. Combining a fractal and emergent approach allows for an organic, dynamic way to express organizational intentionality to orchestrate waves of change, while embracing the need to respond extemporaneously and locally to opportunities and changes that demand surges of responsiveness.

Report

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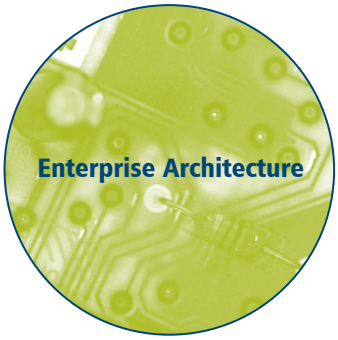

The Enterprise Architecture Advisory Service Executive Report *is published by the Cutter Consortium, 37 Broadway, Suite 1, Arlington, MA 02474-5552, USA. Client Services: Tel: +1 781 641 9876; Fax: +1 781 648 8707; E-mail: service@cutter.com; Web site: www.cutter.com. Group Publisher: Kara Letourneau, E-mail: kletourneau@cutter.com. Managing Editor: Cindy Swain, E-mail: cswain@cutter.com. Print ISSN: 1554-7108 (*Executive Report, Executive Summary, *and* Executive Update*); online/electronic ISSN: 1554-7116.*

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Cutter Business Technology Council

The Art of Change: Fractal and Emergent

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IN THIS ISSUE

This *Executive Report* covers significant landscape-shaping aspects of the dynamically shifting world of our businesses and explores the role of architects and IT as they are being pressed to adapt along with their organizations. It presents an orientation to strategy and architecture, and intentionality and emergence, that fosters agility. We draw on a ranging set of perspectives, insights, and experiences. Pivotal among these is Amazon CEO Jeff Bezos's notion that strategy should be set fractally, not simply centralized at the top but set in different loci within the organization. We hope that you will find that these insights are woven into an inspiring and organically "right" (in a good-fit sense) view of the relationships between strategy and architecture, the strategy-architecture tandem and business agility, and the distinctive role of architects in a world of technology-enriched opportunity and evolutionary pressure.

We start out by considering change and present a market lifecycle model, illustrating that the innovation points, and hence the meaning of agility, shift through the lifecycle. This means that agility takes on different forms in the various parts of the enterprise that are focused on different markets. We also explore broad changes that are reshaping the nature of business across industries, highlighting the role of the web of relationships in complex, interdependent business ecosystems. This, in turn, has ramifications for the strategic role of IT as organizations increasingly compete on, and for, relationships as well as on information leverage. And it has implications for architects.

First, architects are key agents of intentional, proactive change — they identify and lead the creation of innovative systems that are designed, in distinctive differentiating ways, to delight. Working at the interface between the business and technology, watching the technology horizon, understanding technology and business capabilities, initiating and participating in dialogue among and across stakeholders and disciplines, and making connections that make new applications and conceptions possible, architects have a unique perspective on opportunities to innovate.

To further clarify implications for architects, we consider the contraposition: what happens when architects are absent? Then two of the biggest organizational outcomes that are in jeopardy are value through synergy and system integrity. Both have important consequences for agility. Working synergistically enables the organization to see and respond to changes that affect diffuse parts of the business and to create striking and organizationally unique opportunities to innovate offerings or gain efficiencies in internal capabilities. System integrity facilitates changes at least within designed tolerances and potentially also beyond by virtue of a more transparent and understood design and more modular and simple structures.

Yet change, even when intentionally directed, is inherently unpredictable, so we needs must[1] pragmatically embrace the emergent nature of extemporaneous responses that create "messes" and incur a "debt" of increasing change encumbrance. The role of architects in an agile enterprise, therefore, includes taming the transmogrifying mess created by responsiveness, dynamic learning, and accommodation, even while leading with intentionality to innovatively envisage, build, evolve, and sustain systems and their explicit, enabling, and constraining architecture decision sets.

We observe that high responsiveness demands fractal business strategy setting, so that different parts of the organization can change at different rates, with different response styles adapted to the opportunities in their respective markets. This, in turn, raises the need for a fractal notion of leadership. Moreover, these different leadership scopes provide a growing grounds for leaders to emerge and gain practice — to start adopting the attitudes and practicing the skills and behaviors that make great leaders; to begin, within the sphere of influence determined by system impact, to practice "to lead is to see, to frame, to draw."

We will turn our attention to considering forces and factors that our businesses must contend with to flourish and then unfold the implications for strategy and architecture.

CHANGE: NOT WHETHER BUT WHITHER

This report is about not simply coping with change, but taking the ability to change to the level of an art that distinguishes the enterprise. The primary art that is leveraged here is that of the fractal and the dance of the dynamically unfolding fractal rendered visually, which appeals at once to our mathematical and artistic senses. But we will leave that aside for the moment and first regard change, motivating the need to build an agile, adaptive capacity at the very core of the business.

Change: What the Red Queen Told Alice

You may think it obvious to the point of being trite to say that change is "not an option" or "the only constant is change."[2] Yet, with churn in the global economy catching businesses off guard, and a slurry of books like *Subject to Change*, *Change by Design*, and *A Sense of Urgency*,[3] there's also a sense that change is not only imperative but something we need to become good at. We need to be not only reactive, adapting to a changing world, but proactive — changing the world, before it changes us. Why? The analogy of ecosystem[4] and evolution serves to illuminate. Biologists used the term "Red Queen Effect" to describe the necessity of evolving faster than competitors, predators, or prey,[5] so named for the passage in Lewis Carroll's *Through The Looking Glass*, where the Red Queen tells Alice:

> It takes all the running you can do to stay in the same place. If you want to get somewhere else, you must run at least twice as fast as that.

In highly competitive business ecosystems, speeding products along an incremental innovation path[6] is necessary but not sufficient. The ecosystem could be rendered vulnerable at any point by intensifying competition for shrinking, even scarce, resources; a new technology or a new combination of technologies; a new organizational form; or a new capability that transforms the very meaning of value[7] within that ecosystem. Hence, incumbent organizations seek also to reshape the space to gain or sustain dominant advantage. Innovation, with its attendant change,[8] becomes an evolutionary mandate.

At the same time, the organization works to stabilize the ecosystem and its position within it. Building identity and branding, shaping expectation, building and intensifying relationships, and molding the organization to best fit the ecosystems — or value networks — within which it operates to create and distribute value. Building culture and capabilities around its extant value streams, becoming more tuned-up and efficient. All of this shoring up of the organization and the web of the ecosystem or value network adds inertial weight.

A Model of Change: Shock Waves to Diffuse Ripples

Change, adaptation, and responsiveness are imperative, but the locus and mode of change are different at different points in the product lifecycle and market maturity. The lifecycle model in Table 1 illustrates the shift in vectors of change, from innovation in creating a whole new

value model, to innovation in developing and refining the value propositions of the new product genre, to diffusing and elaborating the value propositions, targeting more finely focused market segments. The meaning of "agile," or market responsiveness, shifts — from sheer inventiveness to efficiency of rippling incremental innovations across a product set targeted at more and more diffuse use contexts and purposes.

Early in a product lifecycle, the focus is on uncovering the potential of this new capability (or, usually, set of capabilities). The initial frenzy of activity is around making a market — discovering and advocating the value propositions so that the product or system comes to be embedded in its contexts of use. The focus of learning and change is at first around inventing the product in concept, design, and application, which is to say a novel idea (pure invention or application to a new domain) is developed, capabilities are designed and built to realize the idea, and users begin to adapt their process and context to incorporate this new product or service. Once the meaning of this new product or service is understood and embraced by the market, the focus of change shifts to elaborating that meaning, adding capabilities and tuning it more closely to different needs and uses, and enhancing the internal capabilities associated with producing, scaling, evolving, delivering, supporting, and sustaining a growing customer, and potentially supplier, base.

Thus, differentiation through innovation — through enhancing value propositions in distinctive ways — continues even as the market matures, but the focus of innovation turns to deepening and broadening the

Table 1 — Product/Market Lifecycle Model (for Software Intensive Systems)

	Pioneer: Creating Opportunity	**Emerging Market: Seizing Opportunity**	**Mature Market: Reaping Opportunity**
Characterization	Inventing a product or service concept: • Invention of a new value concept, novel combination of technologies to create new capabilities, new "meaning"	Enhancing the value proposition/ capabilities of the product concept: • Adding features/capabilities • Enriching the "meaning"	Variation on the concept, elaborating value propositions tuned to segmented markets: • High product variation, tailored to more segmented markets, expanding the market (adding products to the family and adding capabilities to products or extending the platform)
Agility Demands	Scrambling to gain early leader control of market by strongly associating brand identity with the novel product concept in market perception and gaining first mover advantages in building and setting the terms of relationships	Scrambling to develop high market fidelity by elaborating features, enhancing brand value, and establishing relationships	Gaining or sustaining dominance through excellence of execution, including speed with which niche markets are created and shored up
Primary Forces	Resource constrained/necessity is the mother of invention High uncertainty, high failure rate	Period of experiment and jockeying, as resource-rich competitors enter the market and vie for prominence in perception and high leverage in market relationships	Pressure to decrease cost and improve customer experience, in the context of increasing complexity driven by diversity in use contexts and "legacy" commitments/ relationships in systems-of-systems contexts
Approaches to Market Leadership	Approaches to early leader identity: • Just do it — get a move on and build the concept and the market	Approaches to achieving high-fidelity identity: • Brand excellence; design integrity and excitement • Reaction speed; quickly ascertaining and bringing valued features to market	Approaches to achieving high variation and leadership in market buildout: • Product variation — Clone and grow; expand the portfolio creating derivative products quickly (then maintaining multiple branches) — Consolidated, extensible product platform, which allows (incremental) innovations to be rippled across the product set more quickly, at lower cost (in development and manufacturing, due to shared components), with greater predictability • Integrated, extensible solution hub — Creating integration points (APIs) and developer kits that allow independent development of new applications or services that populate the related or neighboring product spaces

product set and, inward, to improving internal capabilities and efficiencies.

Of course, that model, like most any, is a simplification. For one thing, markets overlap, and incumbent products in "mature" markets vie with new generations and even genres of products. There is a spectrum from really revolutionary and unprecedented product concepts to novel but with significant precedent even within the market it will shake up. Products are integrated bundles of capabilities, and these capabilities get mixed up in new ways, with capabilities borrowed from other domains as well as inventions that produce new capabilities and new meanings, opening up new avenues of application.

Google Wave, for example, is a novel combination of extant concepts and capabilities, pioneering an extensible in-browser communication and collaboration platform. Leveraging Google's presence in the market, the Google Wave team could roll out an SDK and invite a proliferation of applications hooked into Wave-as-collaboration platform before any user network for Wave was established; the optimism was high enough to warrant investing in riding Wave even before the Google team was fully out of the chute itself. In other words, Google could shortcut the evolutionary process considerably because it already had identity and a relationship base in overlapping markets, allowing it to draw sufficient promise of network density to attract investment in proliferating value propositions on the Wave platform.

Given the different markets large companies shape and are shaped by, the adaptive responses across the organization may well vary. That is, depending on the part of the organization, there might be quite different styles, with some parts acting like they're taking "the low road" of the organizational equivalent of the amygdala,[9] in the words of John Dewey, operating "slam-bang, act-first, and think-afterwards," while other parts take the high road of the prefrontal cortex, acting more "wary and observant."

THE HEART OF CHANGE

While we are still pursuing performance gains from mechanization and digitization, organizations are realizing that people bring something unique and valuable to the innovation equation, and a fresh spate of ecosystem reshaping change has been generated by shifts in the very meaning of business and design. These hinge quite directly on this renewed placement of people — and our creativity, relationships, values, and aesthetics at the center of organization and product design.

Change and the Meaning of Business

An orientation to survival that pits product against product and organization against organization points toward survival of the immediate contention at any cost. This is a short-term, narrow view — the fallibility of which was exposed in the sure-to-be-memorable first Great Recession of this millennium, as well as building environmental sustainability crises ranging from climate change to resource scarcity. In nature, such self-centered, meanly pitched, outright competition may not be the ultimate survival strategy, as explained by biologist John Pepper:

> "The non-cooperator tries to get a bigger piece of the pie, but the cooperator helps the pie be bigger," Pepper said.
>
> "The naive view of Darwinian evolution is that it always favors the most savage, brutal and selfish behaviors. It doesn't — and this is one example of that. In nature, groups of cooperative individuals are more successful than groups of selfish individuals."[10]

In business ecology, this is not exactly new news, is it? We have seen waves of change in the very meaning of what it is to be a business, with more and more organizations across the gamut of industries embracing far more cooperation, blurring and rending organizational boundaries[11] more permeable.

In this ever competitive world, there is growing awareness of systemic interactions, context dependence, and the emergence of new kinds of value from interactions among systems in mutually dependent systems of systems. To be sure, it has always been true that the broader web of the ecosystem consists of systems of systems, but the coupling among these systems is shifting. And the ways we think about these interdependencies is transforming the shape and landscape of organizations. In an interview, economist W. Brian Arthur says:

> If you consider what an economy consists of — organizations, laws, markets, banking systems, and so on — you realize that human beings have created an enormous system of means or arrangements to meet our needs. And then when you look closely at all of these arrangements, which have become enormously complicated, incredibly interlinked, hyper-communicative, and very much dependent on each other, you realize that they are made up of a huge panoply of technologies. I find this actually quite marvelous — that one of our primary accomplishments as human beings is to get ourselves organized to meet our needs, and we've done it in a brilliant way that's evolved over centuries.[12]

This is true within the organization and across its boundaries. Synergy is being sought and wrought across business units and partners in the value network. Sometimes building fulcrum architectures around which a value network forms like Microsoft Windows,

iPod/iTunes and iPhone/App store, and Facebook. And sometimes working cooperatively to create an open architecture like the Smart Grid. Organizational boundaries are stretched by collaborative initiatives, including open source projects, and outsourcing, including outsourcing infrastructure or platform and software services to "the cloud." Boundaries are further blurred as organizations explicitly use social networks to solicit ideas for product innovation and to market and support their products and as ever more work is shifted to freelancing contractors.

In addition to morphing extant business forms, the Internet, like factories and railroads in the Industrial Revolution, has spawned new generations of business ecosystems, including what we might term a "cottage revolution." For example, Etsy created a hub that connects individual artists and craftspeople with individual customers, VRBO connects vacation cottage owners with vacation renters, and Kiva connects micro-lenders with micro-borrowers. This new organizational form aggregates across individuals to create a density of supply and demand, yet maintains individualization — the personal touch. For many, value centers are shifting to individualization and personalization, and the deeper meaning we attach to personal stories — the stories and uniquely personal identity and aesthetic sensibility of the artist-craftswomen or micro-entrepreneur or vacation homemaker — give these new form factors in the market a compelling value proposition. Indeed, in aggregate, they stand to give traditional mass producers and retailers a run for their money, putting pressure on design excellence and aesthetics, increasing the need to address individual appeal, "mass customization," and meaning making.

When it comes to R&D, trends toward "open source" collaborative pooling of resources are creating new organizational "life forms." We've already seen this in software; one organization, The Geek Group, seeks to take this further by providing a setting for geeks to come together to share interests and expertise and gain access to equipment they couldn't afford in a garage shop, allowing individual inventiveness and curiosity to gather a kind of critical mass that spawns new businesses.

The rise of person-to-person (P2P) hubs and social networks does not imply the demise of formal organizations, although the competitive stress it can place on traditional organizational forms is quite clear in something like the news media, where YouTube has created a P2P hub for on-the-spot direct (and unmoderated) news coverage and distribution, while blogs rival traditional print media for getting news and commentary out to diffuse audiences. Likewise, the landscape of the music industry has changed with extensive disintermediation. The net effect is that incumbents in a slate of industries are being challenged to integrate more socially meaningful value propositions, informal networks, personalization, and distinctive design aesthetics as other avenues for creating meaningful, enriched lives are sought in a globally connected world.

The connectivity and creativity that is being unleashed in this Conceptual Age[13] will continue to create opportunity as well as threat — opportunity for those who can act fast and take advantage of the open competitive space a new capability or product concept creates, and threat for those that remain entrenched around a product genre that stands to be outmoded. Amazon CEO Jeff Bezos seized the Internet opportunity to create the world's biggest bookstore, spelling the demise of many brick-and-mortar bookstores and then giving rise to a new lease on life for used bookstores by providing them with a consolidated front to get their goods to a distributed market — a good thing for "long tail" type goods like out-of-print books. With the Kindle, Bezos got in front of the move from print to electronic media, potentially obsoleting the very product Amazon was built upon, namely the book, for he presumably saw the writing on the wall for the dead-tree format along with its transportation costs to the environment and the consumer. Rather than be washed out by this wave of "creative destruction"[14] he chose again to lead in the transformation of an industry.

So we have a mobile phone company (Nokia), a search company (Google), and a personal computer company (Apple) competing to be the dominant mobile device company on the planet. We have a bookstore (Amazon) competing with a mobile device company (Apple) for dominance in digital distribution of books and news media, movies, and music. Leveraging brand — relationships and perception — into new markets, increasing the web of dependence and interdependence, and getting on the next wave of creative destruction before it wipes the business out. These are the change artists we recognize, but every company, from large to small, from the high-tech sector to the personal products and retail industries, is facing the change imperative.

Change and the Meaning of Design

Along with these changes in the meaning — the identity, purpose, and shape — of business, the meaning of design is shifting too. There is increasing recognition of the importance of design that delights the user with an experience that surprises in key differentiating ways.

Delight is about being pleased by how well a design "foresaw" what we would want to do with the product, along with how well it does that! It is about being thrilled with new things we can do or do better; with the problems we can now address; with the aesthetics and compelling fit to our use and intuitive interaction model (see sidebar "Delight"). And it is about not having that delight come undone by factors that jar. So delight is tied to a strong design aesthetic that is about delivering value that goes beyond expectation and makes our life "more the way we want it to be,"[15] as well as integrity, simplicity, and fit — qualities we value. It is to products what Christopher Alexander described as the "quality with no name" in the context of building architecture.[16] Delight creates loyalty and active advocacy. In other words, products that delight "sell themselves"; they create energetic champions who take pride in and are excited about the product. Early on in the market lifecycle, it speeds networking effects, reaching critical network mass with less effort, more quickly. In an age of product proliferation, it helps cut through the clutter, creating a standout choice within a market space. At *TED2008*, Yves Behar said, "Advertising is the price companies pay for un-original designs."[17] We can't expect marketing to create brand miracles no matter what products we create, and we can't expect our sales force to create customer relationships and sell our products even if they generate bad feelings by delivering a dissatisfying customer experience!

We began our discussion of delight referring to products, because that is easy to relate to; we think of our experience with an iPod or iTouch or driving a (pre-2010?) Toyota Prius and listening to Prius owners. When it comes to services, we often associate delight with a person in a service role, with his or her intuitive, empathetic reading of our need and his or her responsiveness to it. But these things are deeply related. Products that delight behave as if they intuited our intent and use model and are empathetic to our situation, our personal desires and aspirations, our need for meaning. And services that delight often have a system that is enhancing the face-person's[18] ability to read us, to read into our situation because they have information about us and about their services unobtrusively available to them. Online services are more like products, because all the appearance of intuition, empathy, and fit has to be designed in ahead of time, rather than relying on the human capacity to dynamically intuit and empathize and use that to shape dialogue to uncover desire or resolve frustration and add meaningfully to the interaction. The point is that delight comes from a pleased kind of surprise. Surprise comes from breaking away from the "me-too" pack. Pleasure comes from fit to need (including new purposes the user didn't know he or she had a moment ago), aesthetics, and other deep commonly held values like trust and harmony.

Moreover, delight isn't — or shouldn't be — something we only think about delivering to our customers. Still, creating products and services that delight, delights — people want to do work they are proud of, and being part of a value stream that creates zealous, delighted customers is a powerful attractor of talent and motivator of creativity. When a design ethos is as strong a part of the culture as it is at Apple, Google, or IKEA, the values spill over into the customer "tribes"[19] that form around distinctive designs. With the Mac, Apple created a concept around which an ecosystem could form: a computing platform for people with a discerning aesthetic sensibility, both for artists and for tech trailblazers. This created an attractor for those who shared the design ethos, and "tribe"-centered applications (e.g., for the musician community) were added to the platform by Apple and third parties. That kind of meaning making creates an ecosystem with webs of

DELIGHT

Delight is a strong word. Setting out to delight — to amaze, dazzle, impress, surprise, even astonish — may seem very well for the peaked few, but competitive spaces are big, and "good enough features at low cost," for example, may create enough business. Still, products that offer utility and appeal to our aesthetic sensibilities or intrinsic values gain emotive traction. Within any cost field, there's going to be stiff competition, so getting out of the cost competition box creates an orientation to organizational health and longevity that has a better prognosis.

We are using "design to delight" as shorthand for design excellence along distinct dimensions customers/users care about, for example, designing to please by creating the feeling of just-rightness in the ways that the system meets and enhances its users and their experience and fulfills some way they'd like to be. You could say it is about requirements and priorities, and it includes that, but also reminds us the intangible experience of delight has elements that we have to intuit and allow for imaginative and aesthetic design leadership to achieve. You could say it is part art, part sheer talent, and part gut feel of an artistic designer. But this designer has to be able to think in terms of guts and skin, of the whole experience of users, across users, across developers, across the value network.

interdependence that pull entities in, amplifying the health and viability of the ecosystem through strong network effects (in the social and economic sense).

Indeed, if we look at the products that have been phenomenally successful over the past several decades, many have to do with enhancing what it means to be human. They enhance our ability to connect and communicate, make art and music more accessible and integral in our lives, elevate our artistic expression, put vast information resources at our disposal, and otherwise enrich our thought lives and personal and interpersonal experience. They enhance our health and increase our longevity, help us manage our resources over that span, make transportation cheaper and safer, give us access to all manner of diversity of experience from ecotourism to living extended lives in virtual worlds like Second Life. As our personal lives become more enriched, we look for more enriched work lives, with a greater sense that technology amplifies and extends our humanity and the best of our creative capacity and need to do worthwhile, meaningful work that builds to something important and exciting in the world.

So businesses are increasingly competing on and for relationships of ever more diverse and diffuse sorts. And delight builds strong relationships. But delight is, as Marty Neumeier points out, a matter of distinctness, of difference.[20] And difference, in an ever-changing market, again, issues the behest to change — to create distinction and keep distinguishing through innovation, proactively reshaping expectation and delivering an advancing envelope of delight to a broadening customer base. We need to pick our vectors of differentiation, applying scarce resources including talent, to create distinctive, meaningful experiences that delight — our customers, employees, and others in the value network.

THE ART OF CHANGE: STRATEGY FRACTALS

Business strategy is all about devising how we will compete. In a fast-paced, ever-changing world with limited resources and shifting opportunities and threats, strategy is, in essence, a matter of determining how we will create and sustain competitive distinction through compelling value propositions, taking advantage of changes in the environment and emerging opportunities and responding to threats.

Strategy as Fractal Code

Bezos's response to a *Harvard Business Review* interview question about strategy setting at Amazon is instructive:

> [Question] Who is setting strategic direction for Amazon? At the very beginning it was just you, sitting in a car on the way from New York to Seattle, making all the plans. Are you still making them all?
>
> [Bezos] Oh, heavens, no. We have a group called the S Team — S meaning "senior" — that stays abreast of what the company is working on and delves into strategy issues. It meets for about four hours every Tuesday. Once or twice a year the S Team also gets together in a two-day meeting where different ideas are explored.... Eventually we have to choose just a couple of things, if they're big, and make bets.
>
> The key is to ensure that this happens fractally, too, not just at the top. The guy who leads Fulfillment by Amazon, which is the web service we provide to let people use our fulfillment center network as a big computer peripheral, is making sure the strategic thinking happens for that business in a similar way. At different scale levels it's happening everywhere in the company. And the most important thing is that all of it is informed by a cultural point of view. There's a great Alan Kay quote: "Perspective is worth 80 IQ points." Some of our strategic capability comes from that.[21]

This notion that strategy should happen fractally is very powerful. Of course we don't want, or expect, every aspect of the business to be self-similar, so we need to be careful where we take the metaphor. Bezos is saying strategy should be set at different levels of scope, at various loci throughout the business — strategy unique to the demands at that level of scope, though informed and unified by the "cultural point of view" and higher-level strategy.

Strategy is a mechanism for business leaders to create coherence of purpose and identity among organizational elements and to create synergies that give a corporate giant advantages over small competitors. We do big things by creating concert among smaller things. To achieve this alignment, business strategy is interpreted — translated, refined, and elaborated into the domain of focus — through the different avenues of more and more granular strategy setting (business unit, business initiative, portfolio or product family, product or service). Strategy characterizes business intent and inspires, guides, and aligns minds, actions, and resources in unfolding and realizing that intent. Recognizing that resources, from financial to talent, are limited, strategy selects from opportunities and allocates and focuses resources. A dynamic strategy adapts to changes, opportunities, and learning. An organic strategy creates the conditions under which elements of the business will flourish through high empowerment, and an intentional strategy creates concert among these elements. The essential pattern of strategy (namely identity, differentiating value

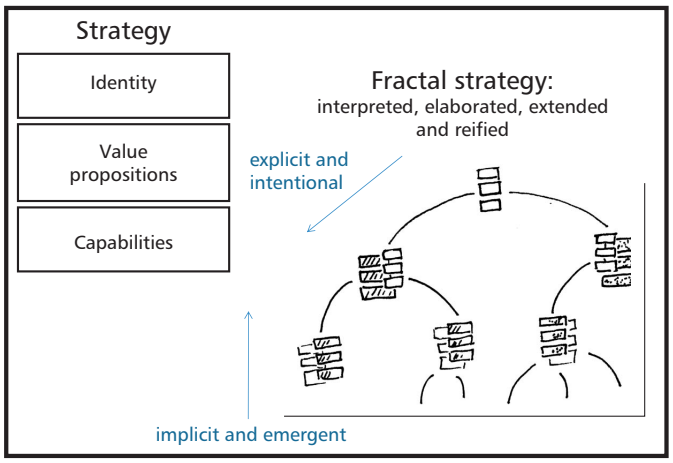

Figure 1 — Fractal strategy transmits core elements of strategy to create coherence of purpose, alignment of resources, and concert among strategic initiatives. An organic and dynamic fractal strategy combines intentionality with emergence, allowing for high empowerment that encourages innovation and responsiveness to opportunity.

FRACTAL STRATEGY

Fractal strategy is, of course, not actually fractal in a strict sense. The term is evocative and calls to mind the dynamic unfolding of fractal visualizations. When strategy happens fractally, these dynamic unfoldings start at various points in the business — wherever strategy is being set — and ripple veins of identity/culture and strategic intent (differentiating value propositions and resource allocations) that are ever more elaborated and organically extended (adding unique elements responsive to opportunities) at more narrow levels of scope, ending in actions, value delivery, and business results. This leverages the important differences in perspective at different levels of scope and allows organic adaptation to the diverse needs and challenges that arise in the different ecosystems or value networks that different loci of the business interact with and serve. It engenders the ability to create synergies working across scopes and the ability to be highly tuned, focused, and responsive at local scopes. The key is not to apply the fractal metaphor in a heavy-handed mechanistic way, but rather in the lightest weight way possible to ensure strategic intent, while allowing the greatest degrees of freedom and empowerment. Culture is a powerful way to convey just enough self-similarity to give a cohesive identity, and all other top-level strategic actions should be judiciously weighed since they focus, align, and coordinate but also conscribe all affected areas of the business.

propositions, and capabilities needed to build and deliver these value propositions as we described in a previous *Executive Report*[22]) is repeated and key themes are maintained, but details are interpreted in the more specific context and elaborated and extended organically (see Figure 1). Product family identity, for example, should be consistent with and reify corporate identity but also shapes a unique mission, values, and a vision for distinctive presence in a particular market. This is important, because the perspective at the level of product scope is different from that at corporate scope. The field of view is smaller — the depth of field greater — at product scope, but synergies across the corporation are out of frame.

A company culture that truly embraces this kind of dynamic and organic fractal strategy setting — and the associated demands for fractal leadership — is more intrinsically agile (see sidebar "Fractal Strategy"). Empowerment to shape strategy is not totally consolidated at the top. It is also not completely emergent from the uncoordinated, nonsynergetic actions at the leaf nodes of the organization. Rather, opportunities are perceived and strategic action is shaped at various levels of scope; some are pushed up for action at a broader, more strategic scope, and some are dealt with locally, at narrow scope. This allows for a dynamic combination of coordinated and decentralized strategy and decision making and for different change rates and styles to be embraced in different spheres of the organization. Moreover, fractal strategy can be set and led across dynamically formed cross-organizational initiatives, rather than along strictly hierarchical lines with their silos or islands.

Fractals, Mix, and Mess!

Fractal strategy setting allows different parts of the organization to move at different change velocities, appropriate to their context and competitive opportunities and threats. While watching for and investing in market reshaping innovations, effective organizations are building out the product set in scale and scope, reaping efficiencies in relationship density: driving down costs through learning and volume on the supply side; enhancing value propositions through a web of relationships on the product development side; and building brand, becoming strongly identified with a value set, and becoming woven into relationships, on the demand side. Always moving, always changing, but with different pressures and opportunities at different points of the organization demanding different responses and different response styles. Fractal strategy and fractal leadership allow for a different unfolding

across the product mix and shifting context, though unified and synergized by the overall business strategy — where it matters!

The late Russell Ackoff, a leader in systems thinking and design applied to organizations, talked about management being less about completely determined and determinable rationalized activity and more about mess management.[23] Dee Hock, Visa founder and CEO emeritus, coined the term "chaordic" to refer to organizations that blend elements of order and chaos, with highly distributed empowerment enabling the organization to balance emergent, situational responsiveness with order.[24] Karl Weick reportedly observed, "Specifically, I would suggest that the effective organization is garrulous, clumsy, superstitious, hypocritical, monstrous, octopoid, wandering, and grouchy."[25]

The effective organization, according to these views, is not a clinically neat, orderly, entirely designed execution machine. It is also not one where all stock in intentionality and design for synergy is tossed aside. Rather, there is an allowance for emergence in the context of intentional strategy, which is to say there is an integration of top-down and bottom-up, with more on-the-ground situational responsiveness where the uncertainty and churn in the market demand fast, local reaction or a new concept demands high innovation with low encumbrance. And more top-down, designed responses where the desire to gain greater cross-organizational synergies demands this level of intervention and constraint to enable a different kind of agility or responsiveness to opportunity. And everything in between!

THE CHANGE ARTISTS: RECASTING IT

What does this all mean for IT? Products, services, and solutions are what we offer customers, but behind those offerings is a web of value anticipation, creation, and delivery. A modern enterprise is an extraordinary network of intelligences and actions — human, compute-assisted, and digital or digitally controlled mechanized actions. Technology is what we solidify business capabilities around to increasingly optimize within a competitive paradigm. More work is shifted from people to digital technologies, processes become more woven into the web of software solutions that support them, and the business becomes deeply embodied in technology — and technology deeply embedded in the business.

IT Lands a Leading Role

We have observed that the meaning of business is shifting in the direction of more complex relationships within and across organizations, allowing for the creation of synergies to produce new kinds of value. Many of the business capabilities that IT supports and enables have to do with building and maintaining relationships and their information spaces[26] to run the business and create strategic advantage. These relationships include supply chains, distribution channels, and direct customer relationships; design agency, formal media, and social networking relationships leveraged to build brand identity; product development networks, including key suppliers and customers (in the *Outside Innovation*[27] sense); product support networks; subcontracting, outsourcing, and vendor networks; and so on. They also include internal networks organized around traditional functions as well as workflows and around achieving cross-organizational synergies such as those that form around cross-selling products or services.

Relationships, both formal (with codified transactions) and informal (with dynamic, even ad hoc, interactions), are enabled through high connectivity. In *Connections*, James Burke, commenting on the Gutenberg printing press, observed that "the easier it is to communicate, the faster change happens."[28] Alternately put, new ideas come about through conversations,[29] and conversations through relationships, and increasingly these are digitally enabled and/or enhanced. This is exciting and daunting, when you add this recognition from Gwynne Dyer into the mix:

> Our intelligence tends to produce technological and social change at a rate faster than our institutions and emotions can cope with.... We therefore find ourselves continually trying to accommodate new realities within inappropriate existing institutions, and trying to think about those new realities in traditional but sometimes dangerously irrelevant terms.[30]

Not only is the organization responding to external change, but these very responses demand internal change, compounding what must be dealt with. The situation is all the more complex, as each organization strives to optimize around its value streams and the extensive and diverse networks that enable it to create value and turn it into revenue and profit. The caveat, though, is that optimization, unskillfully managed, tends toward obduracy — in the face of demands to flexibly recast and make fresh connections and enable collaborations across individuals and groups, even across traditionally well-guarded boundaries.

Of course, we more typically think of IT creating, or overseeing, and evolving the technology facet of business capabilities. Our observations about relationships don't diminish the importance of this role. Indeed, it only becomes more exciting, as innovations in technology enable new kinds of business capabilities and

render some obsolete, demanding yet more innovation and change as the new technology, and what it enables, is understood and integrated into the value stream. A unique role that IT plays, though, is providing the means to interrelate entities and capabilities, along with their information spaces, to create leverage and reap synergies to make the organization more than the sum of its parts. Creating a "relationship platform" for the business in the context of the diversity of technologies, solutions, and micro-cultures, which is the heritage of the dominant "divide and conquer" organizational design mindset, is a nontrivial yet highly strategic undertaking. As relationships are moved onto, and become embedded within, a grid of technology, IT increasingly determines the architecture of the ecosystem, or complex interwoven systems of systems that are the business — which is to say, it enables, constrains, or outright inhibits connections, as well as capabilities. Like any architecture, this is emergent or shaped through intentional (evolutionary) design and guided through governance.

Turning our attention to information, we note that operational excellence, customer intimacy, and market response speed each demand excellence in information husbandry. Both the information and the capabilities associated with transforming data into business-enabling intelligence are prime areas for developing cross-organizational synergies. For example, once localized efficiencies are wrung from a production process, high gains in operational efficiency are sought more broadly across the value stream. More parts of the organization have to collaborate to do this, and their information spaces are no longer independent, isolated, and under purely local control (of the business function, business unit, etc.). The part of the business that supports these cross-cutting capabilities — by enabling information flows and transformations but also by enabling the dialogue that must take place across the different parts of the business — is increasingly enterprise architecture (EA) and IT.

Supporting relationships across more permeable organizational boundaries raises other challenges; connectivity and communication raise security challenges to be sure, but greater information extraction, management, and analytics challenges come with the opportunity to leverage more broad spectrum integration with customers and potential customers and influencers in the marketplace and more diffuse integration with suppliers (including more dependence on outsourcing, open source, cloud services, as well as more traditional dependence on suppliers of tangible parts and products). Increasing response speed is not just about reaction time. It is about instrumentation and analytics giving insight into current operations and the competitive landscape. And it is about foresight — seeing what's coming, transforming information into competitive intelligence. When we recognize that this is a world where organizations increasingly compete on and for relationships, perception, and fidelity,[31] and on information leverage, the strategic role of IT jumps into sharp relief. Place this in a context of change, and IT finds itself with a leading role on the strategic stage. Whether it is playing the role of the proverbial bad guy responsible for runaway costs and change encumbrance or a partner in a landscape-defining dance of change depends very much on how well IT is integrated into strategic decision making — at various levels in a fractal approach to strategy setting.

Design Thinking is In, and IT is "It!"

We also observed that the meaning of design is shifting, not just for products but for services and solutions too. Designing to delight goes from barely, if at all, discussable to organizational mantra in a highly connected world where contagion of delight is the most powerful way to create mindshare for products. Yet as we are drawn into this discussion, we find that other "soft" ambiguous notions like "meaning making"[32] enter the design space. And worse, the very ground under our feet is cataclysmically shifting because traditional organizational islands — the comfortably cleft and isolated zones of intellectual control and organizational power — within the design space come into question when we pursue delight as a goal.

There is growing recognition that design is not just about the guts (à la software design) or the skin (à la user interface design) of systems but involves an interplay between designing user experience and the structures and mechanisms that enable that experience across uses and use contexts. It is not just about user understanding and requirements elicitation, but also about empathy and imagination in creating systems and capabilities with qualities and use modes that users didn't know they wanted! Nor is it just about this domain of expertise or that, but about creating connections among domains of expertise to make new things imaginable and then buildable. Design that delights appeals to pragmatists with empathetic, intuitive fit to purpose and to context and to technical and artistic aesthetes with design integrity that encompasses fit and qualities like simplicity, balance, and harmony. Design that delights is not unidimensional or flatly decomposable. It is about learning, imagining, engineering across the entire value network and

applying that to the creation of value that delights — customers, value partners, employees, and shareholders. It leverages operational and competitive intelligence, feedback loops from users and the value chain, as well as an understanding of technology trends and capabilities, to push the envelope of innovation and user surprise at how well their needs were foreseen, understood, and matched.

We can frame this up as design to delight, the invention of new design meaning, or design excellence. Regardless, design thinking means rethinking how we design products, services, and solutions; the processes by which we design, make, and sell them; and the organizations that do that. In short, design thinking is in, and IT is "it." But only for a moment, because the game of tag is obsolete, and IT is a key player in remaking this baton-passing game into one that is less industrial-mechanical and more organically connected, technologically enabled, yet human-centered.

IT is at center stage because our organizations are inherently systems of socio-technical systems. A social system has inertial forces all on its own but compound these with interweaving of technology in the social system and the mass can be as immutable as reinforced concrete. We might see the enthusiasm with which service-oriented architecture (SOA) was greeted as recognition for the need to flexibly bundle, unbundle, and reconfigure bundles of organizational capabilities, without bringing down and reengineering wide-reaching organizational systems. And this is a step on the path to agility — an important one. But it has to be coupled with other changes, foremost of which is embracing design thinking not just in product development but IT, and more broadly, the design of enterprises, and EA.

EA, AGILITY, AND MESS MANAGEMENT

For a long time, the predominant business assumption was that specialization (around markets and business functions) was the right approach to complexity (divide and conquer), efficiency, and market responsiveness (closer knows best). In a divide-and-conquer paradigm, the "pipes and filters" pattern — with islands (or silos) of information processing, decision making, and action, and "pipes" or information buffers between — works well enough organizationally and for the technology firmament supporting that mode of business operation. This paradigm allows sequential optimization within intellectually well-partitioned spaces, and it has enabled advances to be made that it doesn't do to discount. As long as that organizational form factor was dominant, there was no special need for organizational design. Business units followed markets, and within them, dominant design specified functions. Then, as individuals and groups started to collaborate more to develop and reap synergies not just across functional islands but across the decomposed business units, things got messy.

A Wicked Problem

Conservatively chartered, an EA group may be responsible for setting technology direction and policy, with the goal of increasing consistency and interoperability and reducing duplication and cost. That's one approach to mess management. Consolidate and unify the IT infrastructure, enable connectivity, and drive down costs. But it's not ambitious. You don't put a "ding in the universe" (Steve Jobs) without being ambitious; setting out to delight customers, and in so doing to grow organically and profitably, is an ambitious undertaking. It is setting out to amaze, to surprise, and to outdo. To outdo expectation; trying to outdo the competition keeps the eye too much on gaps of opportunity that the competition is already working on closing and too little on the open space of possibility. To put that ding in the universe, or at least to set customers buzzing, tweeting, and otherwise setting a wave of enthusiasm rippling across global markets, we have to set out to delight. That means we have to design to delight. This is not a matter of product design — alone. It is a matter of enabling the business to anticipate, to make connections, to innovate, to build products that delight. Yes, that. And to design the rest of the experience to delight. The product is the point of closest contact with the user, but there are many chances to enhance or undo the customer's experience. And to enhance or detract from value to other players in the value network. If we look around, we find we're no longer in the category of bare connectivity but well beyond into a rich set of dynamically forming and reforming collaborations, interactions, and relationships.

Enterprise design is now a wicked problem.[33] Even if we (could) separate technology from it, that too would be a wicked problem! Frankenstein's monster followed the "dominant" or prototypical design (the human form) that specified the parts, and their connections, yet it had no design integrity, and it howled at its ill fit to the human context it longed to participate in. How do we attempt to achieve design integrity for so huge and complex a system of myriad overlapping interwoven systems as an organization? And more ambitiously, for so complex an ecosystem as the organization and its webs of interdependencies? And for so dynamic and transforming an organism as an agile organization that on some dimensions is becoming more efficient, while in others is moving into unknown spaces and forming them?

Grady Booch likened enterprise software to a river or river system: the tributaries, the deltas, and so forth, connecting and carrying commerce and supporting all kinds of life, all the complex interrelationships, of the ecosystem.[34] This is a wonderfully vivid analogy that stimulates many insights — including the realization that this isn't just a flow on digital substrate because it weaves in and out of the human dimensions of the organization. Information, to be useful in forming intelligence, flows into and out of, supplements, extends, transforms, and connects human intelligence, but is not independent from it. Actions, too, are not all human and not all digitized and mechanized. There are complex and dynamic interactions, collaborations, relationships, flows, and interdependencies between humans and technology. And, it is worth highlighting (for we seem to depart too easily from this recognition), these should be in the service of a society of humans, not of technology! Designing these human-centered, human-leveraging, human-extending enterprise systems is intrinsically wicked, because they are not easily, neatly, mechanistically decomposable — at least, not if we want to preserve what humans uniquely bring to organizations in terms of creativity and innovation, and the capacity for empathy and to be delighted and hence to seek to delight.

At the same time, it doesn't do to throw up our hands in despair and leave it to evolution to select accidents of ad hoc socio-technical experiment, absent any intervention of intentional mindful design. Earlier attempts at more systemic business design focused on process redesign, but this ignored the interweaving of technology within these intrinsically socio-technical systems. For many organizations, this motivated a shift in how EA was viewed, broadening the field of view from process reengineering on the one hand and enterprise technology on the other to business capabilities. That is to say, it is the rationale for using capabilities as a conceptual building block of enterprises, for capabilities take this conjoint complex of people, process, technology, and other resources, as well as economic, social, and environmental intent, into account.[35] The set of services a business offers, together with their interrelationships, form a valid view of an enterprise. The formal organization, structured in terms of organizational entities and their interrelationships, is another valid view. There are many. Some focus on the business architecture, some on the software-intensive solutions that serve it, and so forth. The capabilities view is an overarching view, and other views focus on separate facets of the complex of elements and relationships that make up an enterprise. Views that render a facet of the whole enterprise (for example, a view of the software solutions and their interactions) could be seen as analogous to anatomical overlays of various systems of the human body, where each overlay takes a separate concern as a focus and leaves other concerns off the view. Other views are more like cutaways, exposing a key interaction among various systems of different kinds. As usual, the analogies don't fit perfectly. Still, enterprise systems are typically complex systems of systems, making the various views all the more important. Not only do these views serve to make the whole comprehensible so that we can understand and improve the design to achieve better outcomes, but they serve as context for the specialty disciplines that focus on, develop, and apply rich expertise in the various facets that make up business capabilities.

Enterprise architecture[36] allows for design across all the interacting entities and all the interacting capabilities, across the scope of the enterprise. An EA group so conceived and chartered, works to understand the webs of enterprise capabilities, and works with business leaders (including the chief enterprise architect) charged with strategic initiatives to build and evolve key enterprise capabilities. Yes, this is still a wicked design problem, involving complexly compounded wicked design problems! Wicked problems don't tend to solve themselves. We might kludge together ad hoc responses and over time find our way to something that works well enough. But if we want to embrace addressing wicked problems[37] as a way to differentiate (focusing, of course, on those that will yield advantage, even delight), we need to do so ahead of the competition. We need to devise "courses of action aimed at changing existing situations into preferred ones"[38] — we need to design. How do we do this? The answer is twofold: (1) fractally, and (2) with an evolutionary combination of intentional and emergent design.

Fractal Strategy, Fractal Design — In Tandem

If we think of strategy fractally but unfold strategy following the two-dimensional space of traditional hierarchical organizations, we end up with the organizational elephant carved up into pyramidal silos and strategy transmitted and interpreted through the management tree. This neatly maintains traditional power structures and has a lot to do with managing information gates,[39] for information is a kind of currency in the principal trade within organizations, namely decision making.

If, instead, we think of strategy unfolding organically around strategic initiatives, around the value network, and around capabilities and relationships, rather than simply step-wise along the lines of traditional hierarchical structure, then we need to allow for more flexible,

organic, interrelating structures and enable not just connectivity but highly dynamic synergy. Of course, this is not new; a good many organizations have been doing this for years — decades even! What is not universal though, is thinking about enterprises in these terms, and it is these terms that allow us to think about strategy and architecture in a new way; one which doesn't make the system-of-complex-systems design problem any less wicked, but does give us a way to gain cognitive traction and lead intentional and reflective action.

Now, we've indicated that we think of strategy as laying out what differentiating value[40] we will create and deliver and what capabilities we will need to build or adapt to do so. And, as our strategy is reshaped, laying out what capabilities we will leverage in the value network, and which ones we can jettison, to focus on differentiation, and what we need to do uniquely and well, to deliver value that delights. Enterprise architecture is the translation of business strategy into a business capabilities architecture and enterprise technology strategy that will enable these cornerstone capabilities. The executive team, ideally working with the chief enterprise architect, will charter initiatives where they are needed in order to build or adapt business capabilities necessary for executing the business strategy. These initiatives, some mapping onto the organizational hierarchy, some drawing new relationships and collaboration across entities, some forming new organizational entities, and so forth, form the next level of strategy setting and architectural design of capabilities and systems.

When strategy identifies the value propositions and capabilities that will be built within the "umbrella" at that level of scope, then architecture can be expressed as an elaboration of the capabilities along with the relationships among capabilities and the architectural elements (systems or parts) and relationships that will deliver those capabilities (see Figure 2). This is a natural way to ripple strategy and architecture decisions through the different scopes of impact to allow local decisions to be made with considerable empowerment, yet be aligned by strategic and architectural context so that systems (some more social/people-intensive, some more technical/compute-intensive, and everything in between) build differentiating synergistic value. This provides a means to allocate decision accountability and provides avenues for governance more dynamically and organically, so the organization responds more organismically to opportunity.

This fractal unfolding, translation, and refinement leads, at different levels, to the reification of business strategy and architectural design. Fractal, because the identity and key strategy and design elements set at a "higher" (meaning more broadly scoped, strategic) level determine a vein of self-similarity. At more narrow, refined scope, new elements are added to the strategy and its tandem architecture, and these yield a new vein of self-similarity that courses through the structures, relationships, and dynamic behaviors of the socio-technical systems that realize the strategy and architecture at that level. In this way, strategy and architecture (the socio-technical strategy and key design decisions for systems of systems at that level of strategic-architectural scope) are transmitted, interpreted, translated, and elaborated and reified in actual systems as appropriate to the strategic and architectural goals at that level of scope of decision making and accountability.

That is a fractal approach to the intentional design of the complex, interacting, collaborating socio-technical systems that make up enterprises. It reflects and makes visible the approach where business intent, and the architectural design that enables that intent, is transmitted to its point of most appropriate impact and highest visibility into the concerns that are crucial to address.[41]

Evolutionary and Emergent

An extreme counter position to this notion that enterprises could be designed — even with a fluid notion of an expanding and dynamically unfolding fractal code — would be to gasp at the sheer absurdity of undertaking something so ambitious, on the one hand, and, foolhardy, on the other, as any kind of intentional design of so complex and poorly (and even mis-) understood an entity as an organization in a context of rapid change

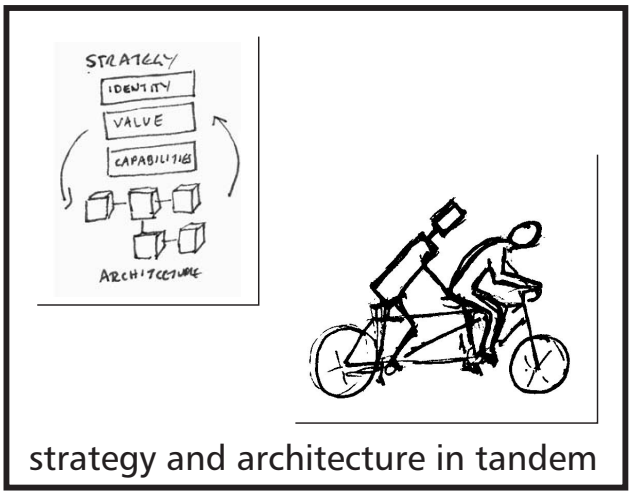

Figure 2 — Architecture translates, interprets, elaborates, and reifies strategy in system designs and guides their implementation. At any scope (e.g., from enterprise to product or service), strategy paired with architecture provides the business direction and technical context for creating alignment and synergy.

coming from such varied sources as typify complexly interacting business ecosystems!

Absurd and foolhardy it may well be! But humanity has made progress by taking on ambitious undertakings, and enterprises are that. We act intentionally so as to make big things happen, to make substantive undertakings real in the world. Nevertheless, whether we admit and embrace it or not, any intentional undertaking in this space is moderated, modulated, or downright thrown off course by surprises, misjudgments, learnings, and all kinds of randomness that come from the interaction of a lot of simultaneous intentional action and random natural events, together with all that is plain unknowable, unlikely, or to which we were simply blind. Not to mention the mess we have accumulated, getting to where we are now. Our approach, then, ought to take this into account, should it not?

The more unknown and novel a space, the more we expect to learn by accident and experiment; the more we allow and accommodate to that, the faster we are likely to learn. It is important in such cases to embrace bottom-up, emergent responses and a highly experimental, exploratory, iterative strategy and design process that fosters rapid innovation. More mature spaces, on the other hand, already have a dominant design that allows componentization and faster evolution[42] and adaptation within the space where that dominant design has, for the time being anyway, an evolutionary advantage. Across the business ecosystems that our organization has a presence in, these different contexts drive different levels and forms of evolutionary and emergent strategy and architecture, but a fractal approach allows the organization to adapt as appropriate to these contexts. The key is to recognize that even in stable contexts, the approach still needs to allow for evolutionary and emergent[43] strategy and architecture. Moreover, the period of initial highly exploratory, fast-paced evolution is likely to leave a legacy of mess to contend with as the market matures.

Thus, fractal and emergent strategy and architecture allows for a chaordic approach that embraces a combination of intentional "fractal" strategy setting with tandem architectural design and the richly innovative, creative, empathetic often extemporaneous solutions that people come up with when empowered to create value and address the challenges inherent in doing so. Still, the "right" balance of order and chaos will be different for markets at different maturity points. For mature markets where highly componentized designs make for quick response to incremental evolutionary advances, too much chaotic, ad hoc reactiveness can undo agility.

This speaks to the importance of business intelligence and the role of dynamic strategy (recall that Bezos said the S Team at Amazon meets every week) as well as to the ongoing role of the architect through the evolutionary life of the socio-technical systems under her or his purview.

ARCHITECTS: WITH OR WITHOUT YOU

When we talk about strategy and architecture in tandem, we imply a partnership between business strategy setters and architects. It is easy, with the tandem image, to think this means that the business strategy setter sets direction, and it is true that this is ultimately his or her responsibility. However, opportunities to innovate, to differentiate through design excellence (conveyed in design to delight) in products, services, and solutions, and the organizational systems that create, deliver, and reap returns from them, are variously anticipated, perceived, and investigated. The architect's role in discovering opportunities to innovate is discussed in our previous report on innovation and agile architecting.[44] Architects, then, are an important source of input to business strategy, helping the organization identify opportunities to catalyze changes that reshape the ecosystem as well as opportunities to adapt the organization's systems to better advantage. And architects are a primary conduit for the translation, interpretation, elaboration, and reification of business strategy in socio-technical, and ultimately software-intensive, systems design. We will turn our focus to this dimension of the architect's role.

One way to get clear about the role of the architect is to ask, "What happens when we don't design the system, when we don't act intentionally to make something happen that hasn't happened, and isn't happening, by itself?" That is a lot of ground to cover, but we will focus on two of the biggest organizational outcomes that are in jeopardy when architects are absent or not empowered, namely value through synergy and system integrity. Both have important consequences for competitive advantage through organizational agility and customer delight.

We will turn first to system integrity and ask what happens when there's no architect? Well, this question itself can morph when we try to answer it, because it leads to the question of what we mean by architect. When we view architecture as something that happens fractally — that is, not just at the EA level of scope, but at more conscribed levels of scope focused on business initiatives or services all the way to specific applications or software-intensive systems — then we have

considerable diversity in the kinds of systems being architected. System integrity is going to mean different things for systems at different levels of scope and focus, but ultimately enterprise architects need to ensure that enough is done to make risk visible and that strategies are in place to respond appropriately within the various scopes in which architecting is taking place.

Without Architects

Let us consider the extremes and what happens in the absence of enterprise architects, on the one hand, and application architects, on the other. The answer, in a word, is: mess. Yes, mess, with its associated "opportunity debt," complexity, and undermining of customer experience.

Opportunity Debt

In the case of application development, the more sloppy, the greater the succumbing to entropy through seize-the-moment duct tape[45] heroics, the more taking quick-and-dirty approaches to responsiveness ultimately creates greater impedance to change, slowing the organization down because the growing "mess" encumbers action. The Tar-Baby in the Uncle Remus stories comes to mind; in the story, everyone who touches Tar-Baby becomes entangled, and the more they struggle, the more entangled they become. The term "technology debt" has been applied to this situation in software development, where structural integrity of the code is compromised to get features shipped quicker, but the lack of understandability, duplication, tight coupling, and other code issues build to the point where new features take longer to add and doing so is more prone to producing errors. The process and the system becomes more unpredictable, leading to further responsiveness issues.

If we broaden this to infrastructure, inconsistent technology choices made in the name of speed and adaptation to local needs make integration more difficult. In the case of data, inconsistent representations of the same entities (like customers) make for data redundancy leading to duplication (for example, of promotional efforts), wasted resources, and lost opportunity. Broadening this to the business operating model, differences in everything from culture and power structures to idiosyncratic processes impede getting collaborative work done across the organization.

This debt analogy comes from front-loading today with something we will have to pay for, with interest, in the future; if we don't pay attention to design integrity, we're not paying our way today but deferring those payments until tomorrow. If we kludge together a good-enough response to get it out more quickly in the near term, we're borrowing against adaptability tomorrow. Our environmental recklessness today is building a debt to the environment that we will have to repay in high costs of containment and recovery in the future. Just like financial debt is incurred when we take out more cash today than we've earned, thereby decreasing cash available in the future, opportunity debt is incurred by taking more than today's dutifully earned opportunity thereby diminishing our ability to take advantage of opportunities in the future. We borrow against the future to build something bigger today than we otherwise could; it is a cornerstone of progress. Yet wanton debt is also our undoing. It is a common attitude that tomorrow will take care of itself, and our opportunism and indiscretion builds a debt that casts a shadow over the future, until we reach the point where it's apparent that tomorrow can't take care of itself.

Gratuitous Complexity

Mess is gratuitous complexity; it is not inherent in the problem but introduced by the approach to solving it. While mess is a result of poor discipline, it can also be a result of islands of responsibility all acting locally, with no sense of what is being done in the rest of the system. Lack of context and perspective breeds inconsistency and misalignment of decisions — a mess when viewed from a broader, overall system or system-of-systems perspective. This complexity can obscure and undermine opportunities to create synergies across systems, so the cost is not just a matter of agility down the road, but also a matter of decreasing the potential value of being a larger organization that has relationships in various value streams and market segments.

Undelight

Not only do integrity issues affect agility, but they also affect the experiences of those who interact with the system. To see this, think of a system where design flaws show up in unsafe system behaviors; delight comes undone in the face of frustration or, worse, peril. Toyota's unintended acceleration problems in many of its car models that came to light in early 2010 serve to remind us that even leading denizens of the quality movement may be humbled by the troubling reach of system complexity and its spillover into integrity issues. And system integrity issues push up into organizational integrity, as all the response systems are tested when major crises emerge in a market. While much of the attention focused on embedded software in the case of Toyota, it is a great case study for enterprise architects

because it feeds back, for example, into questions of how well data on drivers' experiences and accidents was being surfaced and integrated into strategic and tactical decisions and processes. Systems of interconnected systems are, well, interconnected. And the ultimate integrity of a complex system is not generally unraveled by a single point of failure but by failures at multiple points, any of which could have been the start of a determined course of correction.

With Architects

We tend to do what is easy, because that is what is easy to notice, to convince others to do, and to drive apparent optimization around. If right yields the best overall outcome for the organization, right and easy are orthogonal.[46] To put it bluntly, if a system's architecture is no one's responsibility, the tendency is to do what is easy or (locally) obvious. In contrast, the architect seeks to understand what is correct to do from a system perspective to achieve strategic intent — and to make that happen. That is, architects translate, interpret, and elaborate business intent or strategy. And they lead the design, creation, and evolution of systems that deliver the capabilities indicated by the strategy, taking a minimalist approach to enabling the business intent and creating a context that allows considerable empowerment and responsiveness while taking care not to undo future agility. This means that at any level, an architect is in good part working to ensure that in all the pools of work within that scope, the right things are being done to deliver value while meeting the demands for structural integrity and addressing architectural challenges and risk. That means working strategically

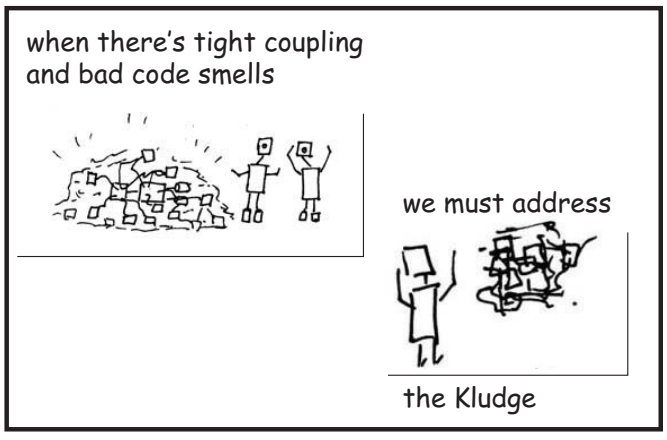

Figure 3 — When responsiveness and "slam-bang, act-fast, and think-afterwards" has produced a "big ball of mud," architects will need to simplify and refactor the system structure into more cleanly designed architectural elements and mechanisms, if it is to see the organization through years of evolutionary adaptation.

on the one hand, shaping the direction, shifting the culture, making big things happen. And working quite tactically on the other, migrating and incrementally introducing order within the chaos but only where it makes sense to do so from a strategic direction and risk management point of view.

YAGNI (you ain't gonna need it) arose as a mantra in response to overengineering and anticipating future needs. Too much time and attention spent on architecture, and the opportunity cost of architecting (the value of the opportunity we're missing, like the cost of being later to market) goes up. Too little, and we incur opportunity debt (including the cost of being later to market in the first and subsequent releases, because the mess slows us down). This is, of course, the wicked problem of balancing the long term and short term, where the short term is what is observable and where the heat of the moment is felt. Hence, from broad scope (that of the enterprise) to narrow (a particular application or service), architects need to assess what is make or break and how best to respond. And despite the pressure to deliver short-term results, architects at every level need to work to simplify and ensure that due diligence is paid to system integrity (see Figure 3). If an architect at one level works to create more simple parts that are composed through simple relationships into more simple, reliable, and predictable systems, then at the next level of system composition, more simple, reliable, and predictable systems can be built.

Architecting to Achieve System Integrity

The architect works to ensure design integrity, at least within the negotiated envelope of design tolerances, and to identify architecturally significant areas of uncertainty, challenge,[47] and risk, and to deal appropriately with them. The next section provides a discussion of architecting software-intensive systems to achieve system integrity, although the values around visual modeling and iterative learning cycles apply to architecting at any scope. Enterprise architects work across the scope of various organizational entities, architecting capabilities and the systems (of systems) that deliver those capabilities. On the one hand, they are creating principles and strategies to set common context and direction, and ensure alignment and goodwill, working to change organizational culture to ensure that the right things happen, without ongoing direct intervention. On the other, they may be chartering and even executing projects to design and build capabilities, choosing specific technologies, and/or setting standards, working sometimes strategically and other times quite tactically but always to ensure that a strategic goal is executed

on. The goal may be to build shared value for multiple entities, to achieve alignment and consistency, or to address an area of challenge or risk that cuts across (facets of) the enterprise. For example, where capabilities are moved from people to technology, and codified, these capabilities become fixed and brittle to the extent that the systems that implement them are fixed and brittle. So the enterprise architects responsible for software solutions may decide to play a role in launching system replacement or migration and modularization efforts, vetting designs and improving the software development process to reduce this risk.

A key though, is that if we want enterprise architects to be ultimately accountable for the integrity of enterprise systems, they need to be enabled and empowered to ensure that architecture decisions have teeth so that architectural intent is enacted and governed, and afforded the bandwidth to evolve the architecture as better ideas emerge or to adapt to change and to recover from extemporaneous responses to local or time-critical demands. This allows for a mindful interplay between intentional and emergent, embracing the generative, organic unfolding of opportunity and innovation while consciously alleviating the downside of chaordic organizations.

Systems of systems, then, are designed in a fractal way, in concert with the business strategy at that level of scope. This enables us to intentionally design and govern loosely coupled, resilient but flexible, systems of systems, yet deal with systemic issues and opportunities, including emergent improvisational responses to changes and unexpected turns of events, as they arise.

Architecting Software-Intensive Systems

For the most part, what we are talking about when we discuss opportunity or technology debt falls under the category of letting design discipline slide, leading to issues with structural integrity (see Figure 4). When it comes to system implementation, the temptation to be fast, often under the nom de guerre of agile, can soften quality controls and threaten product usability, reliability, safety, and lifecycle cost. To counter drift into "big ball of mud"[48] entanglements and shoddy structure, an active and continuous discipline of refactoring and simplification is emphatically advocated.

That said, for systems of sufficient scope and complexity to warrant teams (of teams) working on (incremental) implementation and evolution, the sheer mass of code can make it hard to discover the essential structure from bottom-up decisions made entirely through the medium of code. To create a basis for ongoing improvement, we need to start with a posited architectural structure and work diligently — smartly and with (just enough) discipline — to improve it. To do so, we need to maintain the architecture as an explicit, continuously updated artifact (or set thereof) that enables and reflects design decisions. Recognizing that in system development we are constantly learning, often by trial and error, our process has to allow that some design decisions will be made during system development and some consequences of design choices will only become apparent later. Hence, we need to have a way to feed this back into the architecture both as reflection of changes made to the design and/or as impetus to changing the design. This means that an architect (or team of architects, should the scope and complexity of the system warrant it) should have ongoing architectural responsibility for the system from conception through evolution to assess requests for and make changes to the architecture. Absent this clear and designated decision responsibility, with its accountability for system integrity, the architecture tends to drift not just from the design intent but also into less simple, less modular, more coupled structure and general architectural erosion through ad hoc accommodations.

For a highly novel system, some argue too little is known to architect the system, so the design needs must be emergent. True enough, although we argue that the appropriate medium for all the experiment and learning is not code alone. Indeed, visual architecting[49] can be highly experimental and innovative, placing value on failing fast, and cheap — on paper! It is important to learn by "getting our hands dirty,"[50] whether we are

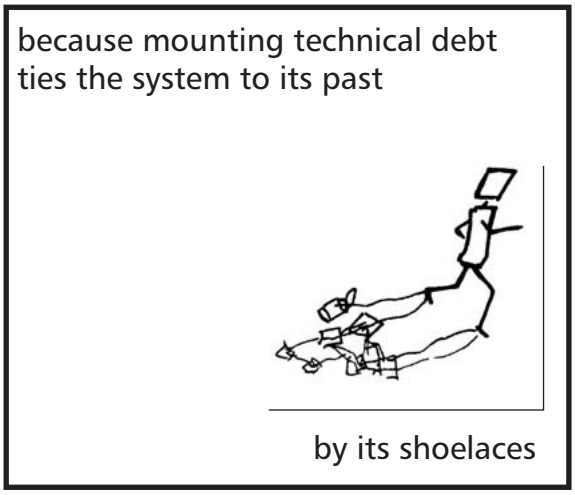

Figure 4 — Tied by its shoelaces to the past, Architecture, personified as Archman, is all set to be agile but is stymied by growing technical debt. Agile is all about responsiveness today — tomorrow will take care of itself. But if we don't take care today, indiscretion builds a debt that bonds the organization to the present, which drifts so quickly into the past.

doing initial exploration and finding a value sweet spot, preparing a "next generation" componentized platform to see a product family through its next epoch of innovation and diffusion into more finely tuned market segments, or creating a next release that seeks to differentiate by adding innovative new features. Getting our hands dirty allows us to learn by quickly cycling through the problem finding/solving creative process, but we need to expand our notion of and get more creative about what "dirty" means. Code prototypes and iterative and incremental system development have an important place, but so does paper prototyping using sketches, models, and system mock-ups. We need to do some mental messing around, playing out ideas in our imagination and on paper, so that we can do focused experiments in code to define, refine, reimagine, and redefine the dominant architectural challenges and figure out architectural strategies to address them. In short, we need to apply the cheapest, quickest design medium to better understand the problem and devise approaches to addressing it, and code is not always the cheapest medium if we allow that a good approach to land on is probably not going to be the first thing we try. So the process needs to be highly iterative, generating interim pieces of the solution to improve the value propositions and/or the system design, using sketches and models early, with targeted code experiments or prototypes, and then building out the system incrementally (still modeling and conducting

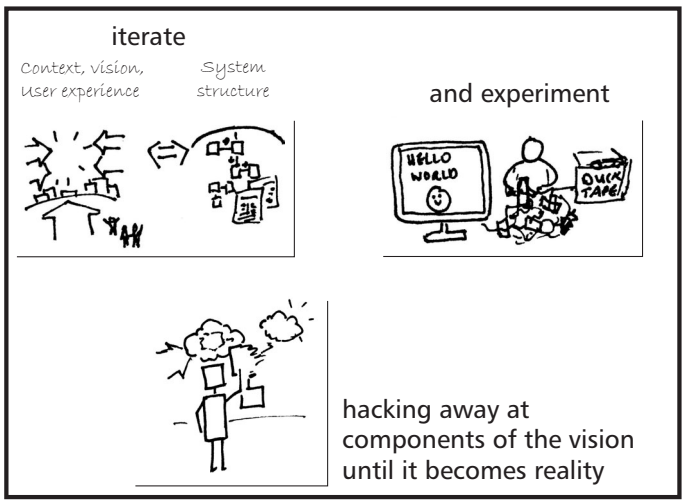

Figure 5 — An iterative innovation process seeks to understand what value to offer and how best to deliver that value. Scientist Edwin Land once said, "You always start with a fantasy. Part of the fantasy technique is to visualize something as perfect. Then with the experiments you work back from the fantasy to reality, hacking away at the components."

experiments to tackle design challenges, but generally more focused/local in scope), all the while improving the architecture and clarifying the value propositions of the system. The cycles continue, with each cycle decreasing uncertainty, resolving challenge, and managing risk, maturing the architecture and the system that implements it (see Figure 5).

By these means, we create an architecture that has the properties Grady Booch[51] identified as fundamental: a clear separation of concerns, crisp and resilient abstractions, balanced distribution of responsibilities, and simplicity. This yields a system where responsibilities have a clear and well-understood location in the system; architectural elements provide clear realms of test, experiment, and change; elements are loosely coupled and the operation of architectural mechanisms is well considered and communicated explicitly; and the interfaces and protocols that enable them to interact are well defined. Booch's fundamentals are very much about harnessing complexity. Stripping away the unnecessary, yes, but also finding the natural interstices and designing mechanisms that cleanly, with elegant simplicity, address purpose and cross-cutting concerns, including system resilience and adaptability. For, in the words of Eb Rechtin, "The essence of systems is relationships, interfaces, form, fit and function. The essence of architecting is structuring, simplification, compromise and balance."[52]

You might notice that as we talk about the process, we are indicating that the value propositions, not just the system structure, are subject to learning and design improvements. We have already introduced this discussion earlier in the report, but we will expand on it here. In particular, we think of system integrity as being broader than structural integrity. Yes, designs are undone by shoddy structure, but great designs do more than stand up to stresses and strains. In the words of Rob Forbes, "The first job of good design is to serve a social purpose."[53]

That is, design must serve people: users, developers, the business, and other stakeholders in the value network (see Figure 6). This is not just a matter of designing the skin, the surface of systems with which users interact. Design integrity, like personal integrity, is a matter of internal alignment that is consistent with external behavior; sooner or later, disjunction and internal misalignment show through any facade that is put on it. Design, then, is not a separable matter of skin and guts. Regarding design, Apple's Steve Jobs said in an article in the *New York Times Magazine*, "It's not just what it looks like and feels like. Design is how it works."[54]

Not just the workflow. How it works internally, yes. But good design isn't simply a matter of cleaving the guts of the system in smart ways and designing the mechanisms that coordinate, choreograph, and facilitate the collaboration of the cloven parts so that the thing works. Good design is about design of the system — from the perspective of the user too. It is about designing the user experience taking into account that tradeoffs are being made that impact users and their process and this has tangible and intangible costs, and tradeoffs are being made in terms of the system building blocks and their interactions with tangible and intangible costs. Internal component behavior and the interaction with the user and the experience that creates for the user are all interwoven, and good design practice acknowledges and allows this interplay to fall within the design space.

So design integrity is not something that should be carved up and passed, baton-like, between different people, fronting disparate fiefdoms within the organization. Many people are going to contribute to this design. And yet, to have integrity, it must be as if of one great mind. This means there must be a leader who can ensure there is an aligned sense of what design integrity is for the system and who can incite people to apply the best of themselves to making the system great. This doesn't mean the leader shapes culture on her or his own, but rather that the leader ensures that a strong culture, with strong cultural mores and values, is built. And on that foundation, a strong strategy and architecture is designed and evolved — again, not by the architect working alone, but drawing people into the process and ensuring that consistent, aligned decisions are made to bring the vision, through stages, to fruition.

Vitruvius identified three characteristics of good architecture: *firmitas*, *utilitas*, and *venustas* — structural soundness, fit to purpose, and aesthetic pleasure.

Design integrity encompasses structural integrity, but also fit to the context and to use (often across varied use contexts) and purpose; it proactively identifies and responds to the game shapers and game changers in the competitive landscape. We emphasize delight because we architects so often get caught up in (the difficulty of achieving) structural soundness that we forget that what we need to be about is delivering all three — *firmitas*, *utilitas*, and *venustas* — in balance.

Architecting to Achieve Value Through Synergy

Complexity is a key driver of architecture. That is to say, as complexity increases, so does the need for architecture. It is not that we want complexity to go away, for value comes hand in hand with complexity. Instead, we want to harness complexity and, as it were, to tame it so that it serves rather than obfuscates and subverts the value we are creating. So we decompose a system into parts, partitioning and hiding complexity in building blocks that need to interrelate and collaborate to yield the intended value of the system. Or we connect existing building blocks. Whether we are decomposing and composing, selecting and composing, or some combination thereof, the properties of the system emerge from the relationships among its elements, not just the elements themselves. That is to say, some new value is added by the relationships that doesn't exist in the elements in disconnected aggregate. This something new is synergy. System design at any level, whether enterprise or in more and more narrow scope to that of a single application, is about this tandem dance of managing complexity and reaping synergy.

This topic, like so many that we have touched on in this report, is exciting and quite worthy of a report in and of itself, but we will restrain ourselves to a scant introduction to highlight the importance of the architect in achieving synergies — synergies that are otherwise left on the table, so to speak, in the absence of the enterprise architect's purview and talent.

Massive-scale, enormously complex systems like enterprises have to be addressed by decomposition along some (actually various) dimensions, and then enabling and managing relationships across the entities

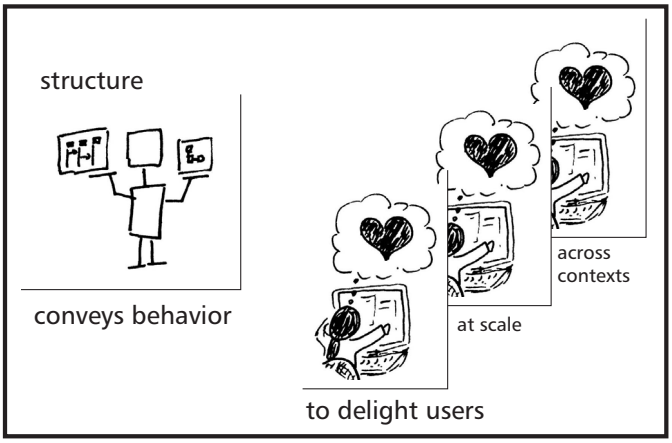

Figure 6 — System structure, or form, conveys behavior. That is, it delivers function, but also system qualities like scale and adaptability. Architects design across the span of the system and its various use contexts, and take into account design forces that will come into play as the system is deployed and evolved. The architect makes tradeoffs to deliver vectors of delight, with good-enough capabilities and properties where that is sufficient.

so created (see Figure 7). Information technology (the technology and the department) in good part enables these collaborations; it is the point of integration, it enables communication, and it provides leverage. Working across organizational and compute-intensive system boundaries means that enterprise architects have tremendous opportunity to create synergy, but the problem is wicked — organizationally and technically, but especially organizationally. Organizationally, enterprise architects are trying to create synergies across entities that have different, even conflicting, agendas, histories, and cultures. This is only exacerbated in organizations that have grown by acquisition, but is bad enough in organizations that have evolved (pretty nicely, thank you very much) with strong silos. So power centers in diffuse parts of the organization tend to defend the independence that gives them greater response speed through self-determination, as well as the ability to adapt more closely to a focused market. Yet by creating dialogue across these entities, enterprise architects are in a unique position to see opportunities to apply technology to build business capabilities that are distinctive in their cross-business value creation. And though this takes considerable leadership skills, they are uniquely positioned to create synergy and leverage across the business and among the business and partners in the broader value network. Do this well, and the innovative capacity of the organization can take off, because, as observed earlier, communication and connections are generative of change.

All things "as a service" (infrastructure, platform, and software) are highly topical right now, so let's take one as an example. Intuit's Grow Your Business Division is creating the functionality to collect and analyze

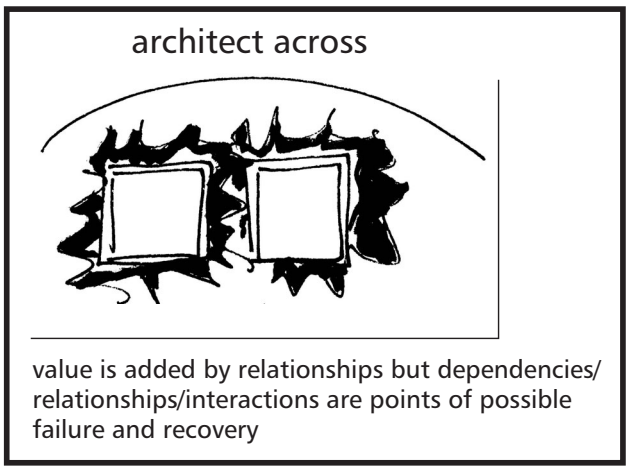

Figure 7 — We need to architect across the boundaries or system interfaces because a system interacts with — shapes and is shaped by — its context.

data across businesses and their markets to create sophisticated analyses that will help its small business customers run their businesses with keen market intelligence. Providing this software as a service (SaaS) functionality to small businesses creates synergies across a potentially vast customer base, building to a market intelligence capability that could give even a business intelligence (BI) powerhouse like McDonald's cause to feel some competitive angst.

Of course, SaaS brings us full circle back to the model we started with (see Table 1). Where SaaS providers have a presence in a mature, well-understood market, and where they have invested in a highly componentized platform for creating service offerings, they are well positioned to compete on cost and innovations targeted at more and more finely segmented markets. Positioned to compete, that is, with internal IT departments coping with "legacy" systems that may constrain more than the commodity solution offered by a SaaS provider. It should be noted, though, that systems (and their architectures) enable and constrain. The architect needs to understand where and how the organization seeks to differentiate, where it seeks to make that ding in the universe and delight customers, and what is needed in terms of systems (of systems) to make this real. That is, the architect seeks to understand what to enable and how best to do that.

Commodity solutions used across a competitive space do not differentiate, though differentiation may be built from a combination of commodity and distinctive services or solutions, reaping unique synergies from the novel combinations. So, in developing a differentiation strategy, the architect ideally works with the strategy setter at that level of scope to understand what technology — open source, off-the-shelf, on-the-cloud, and developed inhouse — makes possible. And, again in tandem with the strategy setter, the architect works to execute the strategy and ripple it through the organization and its compute-intensive systems in that fractal way. All the while embracing the dual of intentionality and emergence — allowing that adaptive responses to environmental change emerge out of local accommodations to and elaborations of the business and technology strategy. These adaptations may be rippled back up into the strategy and its tandem architecture as and where it makes sense to do so, or they may have to be worked back out, to maintain organization and design integrity at that broader scope.

Working internally, enterprise architects potentially have more visibility, more scope of control, more ability to craft dialogue and develop deeper synergy than any vendor — be it in the area of BI, the creation and

enrichment of relationships and collaboration across different parts of the business, the application of technology to create and share new business capabilities, and so forth. Enterprise architects are potentially more connected to the business strategy, playing a role in identifying opportunities to excel and in enabling and executing the strategy.

Potentially. The potential lies in good part in the organization and how the management team empowers the architect role, but it also lies in the architect and the architect's willingness to embrace leadership and initiate and lead change.

MORE ART OF CHANGE: LEADERSHIP FRACTALS

When we think of strategy being set fractally at different loci in the organization, initiating change at different scopes and demanding different adaptive response styles, we see that this implies many demands for leadership throughout the organization. The need that the leader inspires and influences other people to work together to address doesn't have to be on the order of abolishing slavery, creating democracy, giving women equal opportunity, or addressing our environmental footprint. It is true, when we think of exemplary leaders, we tend to think of leaders who propelled epoch changes in history. But the same principles apply to the changes we must make in our organizations to enable them to become much more responsive and adaptive.

Growing Grounds for Leaders

When we see leadership as something that happens in change fractals, we realize that a smaller project scope is a practice ground for many of the leadership skills architects will draw on as they progress through their careers and their scope of influence broadens. The need (opportunity embracing or threat avoidance) is context-dependent, which also means dependent on scope of accountability (set by work context or moral context).

The notion of fractal leadership pushes empowerment throughout the organization. It gives each of us a place to start, as we lead the changes that help our organization become more adaptive, able to catalyze opportunity, and negotiate threat — within our current charter and job scope.

What is more, a leader may be nominated or chartered to lead, or a leader might step into that role because she (or he) perceives an urgent and compelling opportunity to add or create value, a "cause" like entropy that is pulling some part of the organization under with its inertial weight, or some other significant "itch" of dissatisfaction with something in the status quo. We tend to think that in organizational settings (business, nonprofits, government agencies, etc.) leaders are given a mandate, while in social change leaders emerge, touched by destiny, to change history. It is interesting to look at history and realize that even among the leaders we recognize for leading significant social change some saw a need and stepped up to the plate of leadership without any specific solicitation to that role — James Madison,[55] for example. Others were actively persuaded to change their position, influenced to see a need for change as a moral imperative; this was the case with both William Wilberforce and Abraham Lincoln, both of whom saw slavery as morally wrong but needed persuading to take up the cause of abolition. So these leaders were invited, coaxed, inspired to investigate the cause, and seeing the compelling urgent need, they used their personality, vigorous dedication to the cause, and talent at persuading, influencing, and strategizing, to enroll others and bring about change. What is important is that wherever the initial impetus comes from, the leader sees what is needed in the world, becomes inspired with a sense of what to do about it, and rallies and aligns others to get it done.

What Makes a Leader

It isn't enough for the leader to be impassioned by a cause that will take many people to address. Others need to be drawn in, inspired and enabled so that their contributions add up to achieving the outcome that is sought — a bigger outcome than any individual could achieve on his or her own or working without alignment. The art of the leader then, is to inspire more leaders to unfold and build out the strategy in ever more tangible, focused ways. This is a job of inspiring and aligning and of transmitting the core unifying, integrating principles and the shaping context and strategy. These in some ways constrain but in important ways empower so that the system, while emergent through an adaptive evolutionary process, also has the unifying stamp of a single coherent design aesthetic expressed as far as possible in decisions made with intentionality.[56] Now, while an autocrat might be able to use threats and punishment to coerce change in process and decision making to achieve unifying design integrity, this is not typically an option for an architect!

> Early in my career I lamented to an older and wiser colleague that if I only had a higher position with authority, then I could make our software projects go much more smoothly. She set me straight stating that authority is earned through a person's actions, not through their position. She went on to say that trying to influence the work of software developers is much like herding cats. They'll

> do what they want to do and will follow your lead only if you gain their respect and trust through consistent, credible, and gentle means rather trying to lay down the law.
>
> — Rob Daigneau, "The Hard Skills Are the Soft Skills"[57]

In a down economy with jobs in short supply, uncertainty causes more restraint, but even so, people who need to be highly creative can't simply be commanded. We have used the image of pushing versus pulling string; you have to pull string if you want it to go where you want it to go. This is an image of being out front, and a facilitative, servant leader isn't necessarily out front all the time. What is out front is the vision, the compelling thing that needs to be done. Moreover, including those impacted in elaborating the vision draws them in — literally and figuratively.

Leadership comes into play when the architect, through leadership, changes the usual trajectory of a project and inspires and enables the team to rise above the pressures that tend to erode and compromise system structure. And leadership comes into play when the architect is able to "lead the elephant," playing a role in shaping a vision for a great, right system, a system that achieves good fit to purpose and fit to context and delivers differentiating value, even delight.

If the role of the architect is limited to a slice in the lifecycle of the system, we get what is status quo for many organizations — architects who are heroes of crisis intervention. But truly agile businesses need architects who are heroes of crisis prevention and, more, architects who are leaders in innovation and value creation through matching technology capability to business opportunity.

Hence, we are shifting to talking about the "soft" side of getting great things done with and through people with diverse styles and backgrounds — smart, independently thinking, creative, introverted people, and smart, collaborative, exuberantly extroverted people, and more. Technical people. Businesspeople. Big picture thinkers and algorithmic, analytical thinkers. All kinds of people, with all the backgrounds it takes to make the connections[58] that make market-shaping innovations possible!

In a future *Executive Report* that will continue these themes, we will address leading change and in particular focus on how to see a meaningful opportunity, to frame it in compelling terms to draw followers, aligning action and enabling the vision to be built out.

THE ART OF CHANGE, IN SUM

Architects chartered with the design and evolution of business capabilities and the systems that manifest them are implicitly or explicitly working with the strategy setters to choreograph the constantly evolving dance of change, which is a fractal unfolding and elaboration of the business strategy along with locally opportunistic improvisational responses. As we just indicated, this is happening — implicitly or explicitly. However, strategy setters and architects are both more effectively empowered when this is explicit and enabled.

To recap, over the course of this report, then, we have framed:

- The need for agility, the ability to change adaptively and proactively in socioeconomic ecosystems that are increasingly networked and interdependent
- A renewed emphasis on humans at the heart of change, creating product and organizational systems designs with "delight," or innovation and design excellence, as the differentiator
- The fractal nature of business strategy, which means that different parts of the organization can change at different rates, with different response styles suiting the opportunities and threats in their respective value streams or markets
- The emergent nature of extemporaneous responses that bubble up, creating "messes" that incur a "debt" of increasing encumbrances
- The role of architects in an agile enterprise, including taming the transmogrifying mess created by responsiveness and accommodation, identifying opportunities to build new capabilities, and creating synergies across the organization

Leaders articulate something to believe in, revealing how each ding, seeming small perhaps, builds to a big ding — yes, big things are built out of small things. Leaders help the team know what that "ding" is, the big ding rung from the concert among smaller dings. They reveal how the various contributions will make the system, the collective work, be great. People on a team depend on the leader, and all the pools of leadership, to do things worth doing, that build to something amazing, something customers will delight in because it excels where they place value, where it is meaningful to them. Architects as leaders help their organization be the change their future calls for, proactively shaping

opportunity by enabling the collaborations out of which something amazing is made real in the world.

This report addresses the what (fractal and emergent; strategy and architecture in tandem) and the why (change and agility). Our future report will focus on the how. Architects, of course, are the who or the focal audience for the next report, although it will be broadly relevant to anyone who would like to play a (more effective) leadership role.

> You know I used to think the future was solid or fixed, something you inherited like an old building that you move into when the previous generation moves out or gets chased out.
>
> But it's not. The future is not fixed, it's fluid. You can build your own building, or hut, or condo, whatever; this is the metaphor part of the speech by the way.
>
> But my point is that the world is more malleable than you think and it's waiting for you to hammer it into shape.
>
> — Bono, "Because We Can, We Must"[59]

ACKNOWLEDGMENTS

A number of reviewers have contributed substantively to the content and the accessibility of this *Executive Report*, and we would like to thank them for the time they took to read and reflect back to us their reactions and questions. We sent Mark Lane, founder and President of the Center for Advancement of the Enterprise Architecture Profession (CAEAP), a draft late one night, and before turning in that very same night he'd come back with insightful comments that in particular led to significant improvements in the "Architects: With or Without You" section. Don Hirst gave us useful input based on a careful reading, which led to needed improvements in the so-crucial opening section. Daniel Stroe played a role throughout the process of writing this report — first, and importantly, he was a sounding board during the writing (even when he didn't know that the ideas he was responding to and advancing were key ideas in the report), and further, in his generous review commentary, he continued to inspire and advance ideas and images in the report. Scott Andersen helped us improve "The Heart of Change" section, among others, and also reminded us that key messages in this report are relevant to CTO organizations, for example. Keith Frampton is responsible for a number of improvements throughout the report as well as bringing unique challenges in some of the Asia-Pacific countries into the ongoing conversations this report invites.

Grady Booch, in his characteristically perceptive and gentle way, drew our attention to a flaw that threaded the work. In particular, the role of the architect in innovation, in orienting the organization to "being the change, rather than simply reacting to it," was variously implied but not explicit. We hope that we have done justice to the feedback from Grady and all the reviewers who helped us improve this report. Finally, we would like to thank the Cutter Consortium editorial team for its encouragement to write this report and its flexibility with our idiosyncratic writing style.

ENDNOTES

[1]Needs must means "necessity compels" or the imperative conveyed in "must" is driven by need.

[2]"The only constant is change," attributed to Greek philosopher Heraclitus, ~500 BC.

[3]Vebra, David, Todd Wilkens, Peter Merholz, and Brandon Schauer. *Subject to Change*. O'Reilly Media, 2008; Brown, Tim. *Change by Design*. HarperBusiness, 2009; Kotter, John. *A Sense of Urgency*. Harvard Business Press, 2008.

[4]Moore, James. *The Death of Competition: Leadership and Strategy in the Age of Business Ecosystems*. HarperBusiness, 1996.

[5]"The Change Imperative." Changing Minds.org (http://changingminds.org/disciplines/change_management/change_imperative.htm).

[6]Christensen, Clayton. *The Innovator's Dilemma*. Harvard Business Press, 1997.

[7]Verganti, Roberto. *Design-Driven Innovation*. Harvard Business Press, 2009.

[8]"Did You Know." XPLANE, 16 September 2009 (www.xplane.com/company/news/2009/09/16/did-you-know-4-0). Issued first as "Shift Happens" XPLANE's "Did You Know" powerful video presentation is now at revision 4.0. It is designed to prompt thinking about preparing children for the world of tomorrow, but it is also a compelling (and highly visual) message about the pace of change — all the more startling when one compares the first version to the 4.0 version.

[9]Goleman, Daniel. *Social Intelligence: The Revolutionary New Science of Human Relationships*. Bantam, 2006, p. 17.

[10]John W. Pepper, coauthor of a study looking at mating in insects, was quoted in a University of Arizona news story: Jensen, Mari N. "Why Nice Guys Usually Get the Girls." *UA News*, 6 November 2009 (http://uanews.org/node/28404).

[11]This was illustrated by humorous extrapolation in an 18 January 2010 *Dilbert* cartoon by Scott Adams (www.dilbert.com/2010-01-18).

[12]Kleiner, Art. "The Evolution of Technology." *strategy+business*, 4 January, 2010.

[13]Pink, Daniel. H. *A Whole New Mind: Moving from the Information Age to the Conceptual Age*. Riverhead Books, 2005.

[14]Schumpeter, Joseph A. *Capitalism, Socialism and Democracy*. George Allen & Unwin, 1976, originally published in the UK in 1943.

[15]The following words have appeared inside the cover flap of the J. Peterman Company catalog: "people want things that make their lives the way they wish they were."

[16]Alexander, Christopher. *The Timeless Way of Building*. Oxford University Press, 1979.

[17]"Yves Behar on Designing Objects that Tell Stories." *TED2008*, February 2008 (www.ted.com/index.php/talks/yves_behar_on_designing_objects_that_tell_stories.html).

[18]The person who we are getting face time with when we interact; the person who puts a face on the business.

[19]Godin, Seth. *Tribes: We Need You to Lead Us*. Portfolio, 2008.

[20]Neumeier, Marty. *The Designful Company: How to Build a Culture of Nonstop Innovation*. Peachpit, 2008.

[21]Kirby, Julia, and Thomas A. Stewart. "The Institutional Yes: An Interview with Jeff Bezos." *Harvard Business Review*, October 2007.

[22]Malan, Ruth, and Dana Bredemeyer. "Enterprise Architecture as Strategic Differentiator." Cutter Consortium Enterprise Architecture *Executive Report*, Vol. 8, No. 6, 2005.

[23]Ackoff, Russell. "The Art and Science of Mess Management." *Interfaces*, Vol. 11, No. 1, 1981.

[24]Hock, Dee. *Birth of the Chaordic Age*. Berrett-Koehler, 2000.

[25]Weick, Karl. "On Re-Punctuating the Problem." In *New Perspectives on Organizational Effectiveness*, edited by Paul S. Goodmna, Jossey-Bass, 1977.

[26]For example, in customer relationship management (CRM) the information space would include purchases, order status, and purchase patterns; billing information; feedback, reviews, and social networking activity; repeat business and loyalty program activity; warranties and service activity; roll up into market analytics and demand forecasting, and broader demographic patterns; customer offers and response tracking; and more. This information space is not exclusively the purview of sales, but also marketing, customer service, technical support, and production or supply planning.

[27]Seybold, Patricia. *Outside Innovation: How Your Customers Will Co-Design Your Company's Future*. HarperBusiness, 2006.

[28]Burke, James. *Connections*. Paperback edition. Simon & Schuster, 2007.

[29]Leadbeater, Charles. *We-Think: Mass Innovation, Not Mass Production*. Profile Books, 2009.

[30]Dyer, Gwynne. *War: The Lethal Custom*. Basic Books, 2006, p. 441.

[31]We are using fidelity to mean loyalty on the part of customers and value partners and integrity on the part of the business. These are deep concepts in a changing world where competition is increasingly a matter of perception, employee and customer experience, and activism — topics worthy of an entire report in themselves!

[32]Examples of meanings we create or embrace through products include: Twitter: "I am interesting"; iPad: "I am a paid-up member of the Apple tribe of frontier pushers"; Prius: "I am acting on my concerns about climate change, are you?"

[33]As cited in the Wikipedia entry on "wicked problem" (http://en.wikipedia.org/wiki/Wicked_problem): "'Wicked problem' is a phrase used in social planning to describe a problem that is difficult or impossible to solve because of incomplete, contradictory, and changing requirements that are often difficult to recognize. Moreover, because of complex interdependencies, the effort to solve one aspect of a wicked problem may reveal or create other problems." The idea was popularized in 1973 by Horst Rittel and Melvin Webber.

[34]Booch, Grady. "Like a River." *IEEE Software*, May-June 2009.

[35]Malan and Bredemeyer. "Enterprise Architecture as Strategic Differentiator," 2005. See 22.

[36]For more on EA as business capabilities architecture, or the architecting of systems of capabilities, see Malan and Bredemeyer ("Enterprise Architecture as Strategic Differentiator," 2005, see 22); and Bredemeyer, Dana, and Ruth Malan. "What It Takes to Be a Great Enterprise Architect." Cutter Consortium Enterprise Architecture *Executive Report*, Vol. 7, No. 8, 2004. For more on designing in a multifunctional setting, see Malan, Ruth, and Dana Bredemeyer. "Getting Past 'But': Finding Opportunity and Making It Happen." Cutter Consortium Enterprise Architecture *Executive Report*, Vol. 11, No. 8, 2008.

[37]Neumeier. See 20.

[38]Simon, Herbert. *Sciences of the Artificial*. 3rd edition. MIT Press, 1996.

[39]Within product and system development, the gates involve extensive document drops between separately owned and chartered sections of the process flow and is known as the waterfall process.

[40]In Malan and Bredemeyer ("Enterprise Architecture as Strategic Differentiator," 2005, see 22), we indicate that value propositions should be thought of along the dimensions of owner/shareholder value, customer/user value, and value to partners in the value network, including employees, but also vendors and others who generate additional value in the value stream.

[41]Malan, Ruth, and Dana Bredemeyer. "Less Is More with Minimalist Architecture." *IEEE IT Professional*, September/October 2002.

[42]Herbert Simon's work exploring near decomposability and the speed of evolution, and complex systems, is relevant to this discussion.

[43]Evolutionary refers to ongoing adaptation and incremental buildup and buildout of systems based on changes and learning. Emergent makes allowance for decisions that are made "on the ground" or bottom-up responding to local insight and contingency as well as properties that emerge from relationships among parts and systems that are serendipitous, or not, but at least not necessarily knowable in advance.

[44]Malan and Bredemeyer. "Getting Past 'But,'" 2008. See 36.

[45]Spolsky, Joel. "The Duct Tape Programmer." *Joel on Software*, 23 September 2009. Spolsky's essay has been a subject of considerable blog debate, with Martin Fowler and "Dr. Bob" using it as an opportunity to point out that truly agile software development projects are disciplined about technology debt accrual.

[46]Any coincidence between right and easy is a matter of chance, and there is no general relationship between them. For example, simpler is better, but simpler isn't always easy and takes work and experience to reach. We make this point because we tend to act as though what is easy must be what is right, but there is no such governing relationship. Of course, "the winners write the history," which tends to confirm the assumption that what we did had to be right.

[47]Alfred, Charlie. "Value-Driven Architecture: Linking Product Strategy with Architecture." *Microsoft Architect Journal*, June 2005.

[48]Foote, Brian, and Joseph Yoder. "Big Ball of Mud." In *Pattern Languages of Program Design 4*, edited by Neil Harrison, Brian Foote, and Hans Rohnert. Addison-Wesley, 1999.

[49]This paragraph gives a very cursory overview of visual architecting. For more depth of treatment, see the Visual Architecting Process at the Bredemeyer Consulting Web site (www.bredemeyer.com). Malan and Bredemeyer ("Getting Past 'But,'" 2008; see 36) also provides more discussion of visual architecting.

[50]Paul Zeitz uses this term in his work on (math) problem-solving strategies; Zeitz, Paul. *The Art and Craft of Problem Solving*. 2nd edition. Wiley, 2006.

[51]Booch, Grady. "The Promise, The Limits, The Beauty of Software." Talk given at Yahoo! Video, 22 May 2007 (http://video.yahoo.com/watch/577305/2839970). Also see, Schindler, Esther. "5 Things Grady Booch Has Learned About Complex Software Systems." *CIO*, 29 May 2008.

[52]Attributed to Rechtin in Howard Eisner's *Essentials of Project and Systems Engineering Management*, Wiley, 2002, p. 258.

[53]Forbes, Rob. "Rob Forbes on Ways of Seeing." *TED2006*, February 2006.

[54]Walker, Rob. "The Guts of a New Machine." *New York Times Magazine*, 30 November 2003.

[55]The story of James Madison's role in the creation of the US Constitution, and a debrief of its relevance to enterprise architects, can be found in a previous *Executive Report*; see Bredemeyer and Malan. "What It Takes to Be a Great Enterprise Architect," 2004; see 36.

[56]An intentional process is one that attempts to act with foresight, which obviously is fraught with the difficulty that we don't perfectly know the past (and hence can't possibly fully understand the current state of the system or its context) let alone the future. To be paralyzed by fear of that unknowing is just as psychotic as ignoring it altogether! We act with intention, imaginatively play out multiple futures to try to find the game shapers and game changers we can anticipate, put strategies in place to deal with what is big and can be dealt with, keep an eye on shaping forces and trends, and watch for surprises. We accept — even embrace — what emerges from the environment and the complex conjugation of human natures that are organizations, and we act purposefully, harnessing the product of intent and fortune.

[57]Daigneau, Rob. "The Hard Skills Are the Soft Skills." Design Patterns for .Net," 20 October 2005 (www.designpatternsfor.net/default.aspx?pid=25)

[58]Burke. See 28.

[59]Bono. "Because We Can, We Must." University of Pennsylvania Commencement Address, 17 May 2004 (www.upenn.edu/almanac/between/2004/commence-b.html).

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