

Entropy

A SERENDIPITOUS INTERSECTION

The “trivia” question posted in a “Caribou Coffee” shop asked, “Which retailer was the first to offer a money-back guarantee: Sears, Woolworth, Penney, or Montgomery Ward?” I pondered, answered—correctly it turned out—and received my ten-cent discount.

At the time I was reading *The Advent of the Algorithm*, a fascinating chronicle of the 250-year evolution of mathematical logic and computational processes, essential precursors to the digital age. A passage lurking deep in the book resurrected a concept I hadn’t thought about lately. “Entropy”.

My immediate reaction to the word was what one should expect from most thermodynamics students of the last 135 years—a shuddering grimace. Most would remember struggling with an enigma, seemingly illusive to touch and feel.

The math of entropy is relatively straightforward; the dilemma has always been metaphysical. What is entropy anyway, in everyday language? Purely a mathematical contrivance, or something of broader, even philosophical significance? Is entropy good or bad? Should anyone care?

These reflections brought me back to that list on the coffee house blackboard. The grimace became a chuckling smile.

CHANGE AND DISORDER

“en.tro.py. (1) a measure of a system’s capacity to undergo spontaneous change. (2) a measure of the disorder in a system.”

--Webster II

New Riverside University Dictionary, ----

Organizations are complex systems, dependent upon skillful execution and integration of many value chain activities. Effective change management is critical; the struggle is how best to accomplish it. Popular wisdom often has touted revolutionary change, bold out-of-the-box initiatives and institutionalized disorder – “high entropy” characteristics -- as essential to positive corporate performance. But actual evidence appears inconclusive.

- For decades, the “Coffee-House Four” ineffectively face relentless external change and new juggernaut competitors. Despite rescue efforts by large acquirors with deep pockets, two no longer exist.
- GM’s Robert Lutz vows “turmoil and change” as the monolithic giant senses a unique opportunity to reverse its market share slide.
- Legendary venture capitalist Tom Perkins warns that without the Compaq merger, “...H-P will be another Polaroid or Xerox: conservative, risk averse, too reliant on its technology.”
- Amidst globalization and technological discontinuity, Kodak announces yet another restructuring. The latest emphasizes discipline, structure, operational excellence and a simpler organization.
- Hampered by inertia and overconfidence, Coca-Cola suffers share and profitability erosion at the hands of a nimbler, more aggressive PepsiCo.
- Noting repeated diversification failures, Sears’ new CEO concentrates on traditional brands, departmental profitability and historical product strengths. Results improve. Penney mirrors a similar pattern.
- Disillusioned with disruption, sinking morale and poor performance, Mattel, Procter & Gamble and Ford all replace ‘big change,’ outside CEOs for stabilizing homegrown personalities. Each vows stricter controls, a focus on basics and return to historical values. Results at Mattel and Procter & Gamble have already improved.

IRREVERSIBLE EVENTS

“...[A]ll actual processes are...in some degree...irreversible...a system and (its) surroundings can never

both be restored to their original states...entropy...is a measure of this irreversibility..."

--H.C. Weber and H.P. Meissner
Massachusetts Institute of Technology, 1963

In a perfect world, companies would see the future clearly, pick the right strategies the first time and execute flawlessly, or be able to correct missteps without penalty. And total entropy would not change.

But real corporate life is imperfect, time doesn't stand still and environments change.

- Walter Hewlett is roundly criticized for offering no alternative to the Compaq merger, except H-P reverting to its historical printer business—a defensive just-say-no posture at best, say his detractors.
- Paralyzed with indecision, Motorola begins the switch from analog to digital much too late. The battle for digital dominance had already been won by Nokia. Six-sigma status in an outdated technology is little consolation.
- Three years into major strategic leaps, AT&T changes course, retreating to its roots as a long distance phone company. But that world and its formula for success have changed greatly. While the company tries to survive, its debt is downgraded to almost-junk status.
- A great heritage and promising start notwithstanding, Lucent's big initiatives fail. Trying to get back where it started, the company finds itself in a cascading downdraft, its environment continually shifting at each level.
- In a bad year for venerable names, Britain's Marks & Spencer and Cambridge's Arthur D. Little are left behind by irreversible change. Trying to stir at the end, each finds it has no place to go.
- Having become what Business Week calls an "irrelevant faded icon" Cadillac finally shows some life. But can the brand come back given a vastly different landscape?
- Amazon.com unexpectedly reports its first profit on the same day Kmart files bankruptcy. The significance not lost on The Wall Street Journal, the stories run side-by-side. An exclamation that time moves on—irreversibly.

WASTED ENERGY

Proposing his new function in 1865, Rudolph Clausius noted an interrelationship to energy so important that it influenced the name he chose: "I have designedly coined the word entropy to be similar to energy, for these two quantities are so analogous in their physical significance..."

In fact, the relationship was negative. Begotten of disorder, imperfection and irreversibility, entropy would represent the dissipation of energy -- that portion of energy not available to do something useful in a system undergoing change.

THE CORPORATE ENERGY/ENTROPY MATRIX

An earlier Strategy FOCUS introduced 'corporate energy' as the sum of strategic and organizational attributes that make a business strong. These can include size, physical mass, speed, intensity of effort, infrastructure and technology, brands, market position, special core competencies, management depth, discipline and exceptional human resource development.

Now consider a concept of 'corporate entropy'. Characteristics might include propensity to change quickly and/or in great leaps, high risk-tolerance, a tendency to randomness or unstructured organization, undisciplined style, contrariness, exceptional creativity, and "broad" business unit diversity.

Corporate energy is essential for long-term effectiveness and inherently good. What about corporate entropy? Clearly too much is bad, with consequences ranging from wasted energy and squandered opportunities in an otherwise well-positioned enterprise, to catastrophic failure in an organization lacking basic strategic and operational fundamentals.

If too much corporate entropy is bad, is very little entropy good? Alas, it's not that simple. Too little is also dangerous, leading to corporate inertia, complacency, denial, missed opportunity, vulnerability to paradigm

shifts and competitive attack and permanent loss of vitality.

Exhibit 1 is the Corporate Energy/Entropy matrix, proposing the strategic positioning of an organization based upon its energy/entropy combination. The High Energy/Medium Entropy position is the most attractive, with Low Energy/High or Low Entropy the most dangerous. Exhibit 2 adds the "Strategic Effectiveness" dimension and postulates where some corporate names might currently lie.

One piece to this puzzle remains. In addition to organizational entropy, we must return to the external environment.

ENTROPY OF UNIVERSE INCREASING

"There is no such thing as the conservation of entropy principle... The entropy of the universe is constantly increasing."

- Second Law of Thermodynamics

Around 1900 Ludwig Boltzmann was the first to interpret entropy as disorder. His deceptively simple equation identified increasing entropy as the most probable state of affairs. A keen observer of the human condition beyond physics, Boltzmann noted that, in time, things just seem to fall apart.

Universal entropy has had a big year: dotcom collapses, Argentine chaos, WorldCom, the telecom meltdown, California's energy crisis, troubles at AT&T, Xerox, Lucent, Polaroid and Kodak; continuing emergence of China, Kmart and Global Crossing bankruptcies, Enron/Andersen, and 9/11 and its evolving aftermath. Not only might Boltzmann say, 'of course,' he would remind us that according to his equation, entropy has no upward limit.

TRANSFORMATION

Clausius chose the word entropy for a second reason. The Greek translation is "in transformation."

Corporate transformation takes several forms. A successful entrepreneur creates a real business from a new technology. An otherwise healthy organization intentionally changes direction so its future can be as successful as its past. A troubled organization rejects denial and rights itself before it is too late. A family business transforms itself each time one generation passes to the next.

Enduring organizations transform themselves repeatedly across decades of change and through generations of leaders. Such companies share certain characteristics:

- Rather than long for yesterday's simpler world, they understand increasing external complexity. Top-line oriented, they drive internal change while creating cultures as effective counterweights to surrounding disorder. Good at quantifying and managing risk, they can change specific strategies without losing focus and discipline.
- Rejecting the silly cliché about not fixing what "ain't broke," they understand time moving forward, the irreversibility of events and the natural tendency of things to come apart. Unlike the fleetingly successful (e.g., Montgomery Ward and its guarantee!), they know that one good idea never lasts forever.
- They minimize the darkest face of entropy – distractions and wasted energy. For change to be positive, they appreciate strong foundations are needed in those things that don't change.

Inevitability and constancy of change, ticking clocks and no looking back, increasing disorder and complexity all around, focus and balance – all are part of the natural process of transforming something from one state to another. Though difficult, the process has been around a long time. Ancient Greece had an appropriate term for it -- "en tropé".

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REFERENCES

Bannon, Lisa. "Taking Cues From GE, Mattel's CEO Wants Toy Maker to Grow Up." *The Wall Street Journal* 14 November 2001: A1, A10.

Berlinski, David. *The Advent of the Algorithm: The Idea That Rules the World*. United States of America: Harcourt, Inc. 2000. Chapter 12.

Berman, Dennis K. and Lublin, Joann S. "Russo's Goal as Lucent's New Chief: Restore Luster." *The Wall Street Journal* 8 January 2002: B1, B4.

Chen, Hamn-Ching (Professor of Civil and Ocean Engineering). "Some Remarks about Entropy." <http://ceprofs.tamu.edu/hchen/engr212/notes16.ppt>.

"Entropy: The Origin of the Word." www.es.uscs.edu/~smf/entropy.html.

Forest, Stephanie Anderson. "A Speedy Makeover At Penney's." *Business Week* 29 April 2002: 92, 94.

Foust, Dean and Khermouch, Gerry. "Shaking Up The Coke Bottle." *Business Week* 3 December 2001: 74-75.

Helliker, Kevin. "Sears Estimates 11% Increase in Fourth-Quarter Earnings." *The Wall Street Journal* 11 January 2002: B4.

Jenkins, Holman W. "How to Be a Dissident Shareholder." *The Wall Street Journal* 27 February 2002: A21.

Lashinsky, Adam. "The defiant ones." *Fortune* 7 January 2002: 70-71.

"Bob Lutz, the oldie with the task of rejuvenating the world's largest car maker." *The Economist* 5 January 2002: 62.

Matheson, David. "Growing the Company from Within: R&D & Portfolio Management Tools for the Middle Market Executive." Association for Corporate Growth Intergrowth 2002 -- 11 April 2002.

Merrick, Amy. "Kmart Lays Out Plans to Trim Its Size, Increase Efficiency in Bankruptcy Filing." *The Wall Street Journal* 23 January 2002: A3, A6.

Meuchner, Gerard and Allen, Paul C. "Kodak Announces New Operating Model, Business Alignment to Build Profitable Growth." Business Wire – Hoover's Online 14 November 2001.

Nelson, Emily. "Diaper Sales Sagging, P&G Thinks Young To Reposition Pampers." *The Wall Street Journal* 27 December 2001: A1, A2.

"Tangled webs." *The Economist* 25 May 2002: 67-69.

Weber, Harold C. and Meissner, Herman P. *Thermodynamics for Chemical Engineers* – Second Edition. New York: John Wiley & Sons, Inc. 1963. Chapter 10.

Welch, David and Khermouch, Gerry. "Can GM Save An Icon?" *Business Week* 8 April 2002: 60-67.

Wingfield, Nick. "Amazon Had First-Ever Profit In 4th Quarter." *The Wall Street Journal* 23 January 2002: A3, A8.

Young, Shawn. "AT&T's Long, Troubled Trip Back to Its Past." *The Wall Street Journal* 21 December 2001: B1, B4.

Zuckerman, Gregory and Young, Shawn. "Moody's Cuts AT&T Credit Rating." *The Wall Street Journal* 30 May 2002: B5.