Complexity leadership: the secret of Jack Welch’s success

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Abstract: Leadership theory still focuses on vision and charisma and is stuck at the bottom of hierarchies. What style of leadership did Jack Welch actually use to manage the 350 business units comprising GE to increase its stock value 1,000s of percentage points higher than the Dow Jones Stock Index, stay in office for 20 years when most CEOs are ‘temp workers’, and produce some $480 billion in shareholder wealth. Welch is an instinctively great manager, but not well clued in on the action-specifics of why he did so well. Complexity science offers 12 ‘action-disciplines’ that appear to be the means by which Welch was able to enable and steer GE to produce incredible wealth. He put complexity theory into practice. Put more dramatically, Welch replaced old-style, top-down ‘management by objectives’ with ‘management by tension’. Evidence is offered to show that Welch’s methods were not learned by all the GE-trained managers who became CEOs of other firms. But some outstanding CEOs of major firms appear to be using the complexity action-disciplines as well. This article explains the secret of his success.

Keywords: leadership; management; complexity science; tension; emergence; innovation; CEOs; Jack Welch; GE; stock value; shareholder wealth.


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1 Introduction

Over the years, there has been a constant plethora of writings making clarifications to traditional leadership theory (e.g., Hogan et al., 1994; Bennis, 1996; Dansereau and Yammarino, 1998a, 1998b). Bolden et al. (2003) suggest that nothing in leadership theory has changed since mid 20th century, except for the
appearance of transformational/transactive leadership (Burns, 1978; Bass, 2002) and
distributed/dispersed leadership (Gibb, 1954; Bryman, 1996; Gronn, 2002). Writing in
the early 1990s, Rost observes that the 130+ books on leadership published in the 1980s
substantiate the orthodox message that ‘leadership is basically doing what the leader
wants done’ (1993, p.70). Writing in 2003, Marion and Uhl-Bien say that leadership
theory is still vision-driven, top down, consensus and control oriented, with direct
influence attempts by the leader. Leadership theory is still mostly stuck at the bottom of
hierarchies; it is mostly about how ‘heroic or charismatic’ superiors [Bennis, (2007),
p.3], who have ‘wisdom, intelligence, and creativity’ [Sternberg, (2007), p.34] should
‘lead’ followers in a face-to-face context. While they say the foregoing are still
appropriate, Marion and Uhl-Bien point out that leadership also involves “…creating the
conditions that enable productive, but largely unspecified, future states” (2001, p.391).

Because of the failure of leadership and leadership theory at the CEO level, we see a
recent focus on CEO churning (Bennis and O’Toole, 2000; The Economist, 2001;
Lucier et al., 2003). Lucier et al. (2005) go so far as to call CEOs ‘temp workers’. In short,
the more aggressively CEOs pursue their visionary leadership from top-down, the more
damage they create most of the time. Why? The Economist (2001) says that firms are
now much more difficult to manage for reasons such as flattened hierarchies,
globalisation, the digital age, and mega-mergers. We also see that ‘celebrity CEOs’
brought in from outside do well at first – by cutting costs – but then fail in the second half
of their tenure (Lucier et al., 2005). Agreeing with Avolio et al. (2001), Brown and Gioia
(2002) say that “…leadership is not solely a set of characteristics possessed by an
individual, but an emergent property of a social system, in which ‘leaders’ and
‘followers’ share in the process of enacting leadership” [quote taken from Parry and
Bryman, (2006), p.455, my italics]. The idea of emergent, distributed leadership is further
developed by Marion and Uhl-Bien (2001, 2003), McKelvey (2001, 2008), Uhl-Bien et
al. (2008) and other ‘complexity leadership’ writers in the edited volumes by Hazy et al.
(2007) and Uhl-Bien and Marion (2008). Bluntly put, there is much more to good
leadership that what is offered by psychologists.

For this article, I am taking a ‘reverse’ logic. Instead of propounding more ‘academic
theory’ about what aspiring CEOs should do, I go back to ‘square one’ of leadership at
the top of giant firms: I am going to zero in on Jack Welch, CEO of GE from 1981 to
2001 (when he retired) – no ‘churning’ here. Instead of more regurgitated chatter by
academics about what good leadership is, lets start from Fortune Magazine’s ‘Manager
of the Century’ and rebuild leadership theory from the ground up by studying what Welch
actually did that produced some $480 billion in GE shareholder value. Instead of
statistically sound empirical studies about ‘average’ leadership, let us focus on the
business leader with the best performance in the 20th century! And he did it with the
oldest member of the Dow Jones Stock Index.

I argue that it was Welch’s ability to carry out ‘complexity leadership’ that produced
such amazing results. In what follows, I first try to substantiate this by connecting key
elements [I will call them ‘action-disciplines’ (A-Ds)] of complexity theory to actions he
took at GE. Second, by making some market-capitalisation (stock-performance)
comparisons with other GE-spin-off CEOs, I argue that Welch did not really know why
he was so good at managing GE; the records of almost all ‘spin-off CEOs’ suggest that
they learned virtually nothing from Welch or their experiences at GE. Also, there is little
evidence that any of the CEOs and top-management teams ‘educated’ by visiting the GE
Training Institute, or by reading Welch’s several books (or other books about Welch at GE) replicated Welch’s leadership performance at GE. Finally, I will show that a substantial number of top performing firms, CEOs, and turnaround events appear to be based on the presence of the most critical A-Ds, as opposed to attributions of learning and success to existing books by or about Jack Welch.

Given inadequacies in leadership theory, I turn to Welch for a new approach. After a brief review of leadership and complexity theories, I suggest 12 complexity-based A-Ds as the basis of Welch’s unique managerial success. The success of GE-trained CEOs is then shown to be inferior to Welch’s. Finally, I present some evidence that other highly successful CEOs used the complexity A-Ds.

2 Brief review of leadership theory

In a changing world full of diverse political, economic systems and competitors, corporate leaders must be able to create cellular networks (Miles et al., 1999) and complex adaptive systems (Marion and Uhl-Bien, 2001, 2003). They need to learn how to promote agent heterogeneity and enable connectionist networking, self-organisation, and adaptive learning, in search of improved agent and collective fitness. Most leadership theories go opposite to this. And they need to know how to constructively use ‘management by tension’ to get their complex system into phase-transition mode.

Traditional leadership theory focuses on attributes and skills of leaders and the subsequent impact of leaders on individuals and groups of followers within an organisation (Bennis and Nanus, 1985; Bennis and Biederman, 1996; Hogan et al., 1994; Dansereau and Yammarino, 1998a, 1988b). Klein and House (1998, p.3) say that, “charisma is a fire that ignites followers’ energy, commitment, and performance”. Their approach focuses on ‘mythic’, ‘heroic’, ‘visionary’, leaders. Building from House (1977) and Nanus (1992), Bennis (1996) describes the visionary leadership school of thought:

“Leaders need to have a strongly defined sense of purpose. A sense of vision.... Leading means doing the right things...creating a compelling, overarching vision..... The capacity clearly to articulate a vision.... It’s about living the vision, day in day out – embodying it – and empowering every other person...to implement and execute that vision.... The vision has to be shared. And the only way that it can be shared is for it to have meaning for the people who are involved in it. Leaders have to specify the steps that behaviorally fit into that vision, and then reward people for following those steps.”

(pp.154–156; his italics)

Drawing from tradition, Bennis and O’Toole (2000) attribute the recent increase in CEO turnover to lack of charisma and vision. Leadership scholars stress the importance of the ‘mythic’, ‘heroic’, ‘visionary’ leader for creating strong cultures (Peters and Waterman, 1982; Schein, 1992) and leading culture change (Kotter and Heskett, 1992). Sorensen (2002), however, shows that strong cultures are assets in stable environments but liabilities in changing times. Willmott (1993) claims that ‘culture management’ is a new form of managerial control.

Finkelstein (2003) suggests that ‘normal’ explanations such as leadership failures are inadequate to explain CEO dismissal. Supporting The Economist’s view, Finkelstein (2003) concludes that “CEOs fail to carry out standard strategic essentials competently”. He does not attribute CEO failure to board processes in selection as it would be hard to
imagine a modern board hiring a CEO who did not include the ‘strategic basics’ in his/her ‘vision’. Who would hire a CEO who is ‘against’ entrepreneurship, innovation, synergies from M&A, and understanding the competition? Since all CEOs have this vision, he argues, especially in a boom economy and at the so-called Dawn of the New Age, this focus on strategic essentials takes ‘vision’ out of the mix – the ‘vision’ variable does not separate good from bad CEOs.

A partial movement beyond tradition is based on the transformational leadership concept (Burns, 1978; Bass, 1985; Bass and Avolio, 1994) which consists of four components: vision and charisma; high expectations; personal attention to followers; and challenging followers with new ideas (Bass, 2002). But even this approach works against CEOs trying to build decentralised, self-organising cellular networks. Why? According to Marion and Uhl-Bien (2003), transformational/transactive leadership is still vision-driven, top-down, consensus and control oriented, with direct influence attempts by the leader. It focuses on follower ‘buy-in’ to the leader’s vision of the future. More specifically, they argue that transformational leadership still holds to:

- top-down, leader controlled views of organisational processes
- hierarchical- and position-based formal leadership initiatives
- emphasis on followers carrying out the leader’s vision
- stimulation of followers to align with the leader’s vision
- direct influence efforts to assure that followers are following the leader’s vision.

Though transformational leadership tries to emphasise follower alignment with the core vision, in reality it still relies on followers’ compliance behaviour.

Finally, building from Gibb (1954, 1958) and Brown (1989), Bryman (1996) picks up on distributed leadership to take us from trait, style, and contingency approaches to what he calls ‘dispersed leadership’ – a ‘new leadership approach’. Hosking (1988) emphasises the network building functions of effective leadership and the cultivation of social influence. Katzenbach and Smith (1993) focus on a kind of leader who fosters the emergence of small teams. Kouzes and Posner (1993, p.156) say that good leaders ‘turn their constituents into leaders’ and liberate employees ‘so that they can use their abilities to lead themselves and others’ [Bryman, (1996), p.283]. Linstein and Grafton-Small (1992) view culture formation as ‘dispersed’ rather than flowing monolithically from the vision of a heroic leader. They have the right idea, but the ‘how to do it’ part is vague.

Gronn (2002) offers the best review of distributed leadership (but also see Bennett et al., 2003). It is “aggregated leadership…dispersed among some, many, or maybe all of the members” of an organisation [Gronn, (2002), p.429]. He builds from Gibb’s ‘multiplicity or patterns of group functions’ and a ‘leadership complex’ consisting of numerous roles (quoted on p.429). Gronn points to three essential ingredients:

1. collaborative modes of engagement
2. the intuitive understanding that develops as part of close working relations among colleagues
3. a variety of structural relations and institutionalised arrangements (p.429).
But, these can also be the ingredients of Janis’s ‘groupthink’ (1972). Gronn’s analysis is an after-the-fact description of leadership ‘distribution’ but his review offers no set of leader actions that would actually get a complex system to become more efficient, or change its nature so as to become more efficaciously adaptive in a changing highly-competitive business environment; and his review applies only to ‘numerically small work groupings’ (2002, p.447). Given this, distributed leadership, as currently described, is only one of several elements contributing to GE’s success.

3 Why Jack Welch at GE?

Let’s start with some evidence on performance:

- In great contrast to current CEOs, which Lucier et al. (2005) label ‘temp workers’, Welch was CEO for 20 years till he retired, i.e., 1981–2001.
- GE’s revenues in 1980 were $25 billion; the year before Welch retired in 2001 they were $129.9 billion.
- GE’s stock averaged a return of ~21% per annum from the day he became CEO (Sirisha, 2002).
- Welch raised GE’s market-capitalisation from $12 billion in 1981 (Hartman, 2003) to some $480 billion in 2001 (Sirisha, 2002).
- Welch supervised 993 acquisitions worth $13billion.
- He accomplished the above in a 100 year old, ‘old-line’ firm making mostly ‘commodity-like products.

They say a picture is worth a thousand words: in Figure 1, I use market capitalisation as the basis for comparing Jack Welch’s accomplishments with others; as one can see, during the 20 years he was CEO at GE the stock went through five stock-splits and gained over 7,000% in increased value.

In what follows, I argue that Welch’s leadership approach puts many elements of complexity theory into managerial practice – albeit something that neither he nor anyone else seems aware of. Since GE developed its ‘boundaryless organisation’ approach (Ashkenas et al., 1995), GE has moved to elaborate a system whereby ‘best-practices’ discovered in one section are quickly spread to other parts of what is now a vast ‘related multidivisional’ kind of firm (Williamson, 1975) – GE had 350 business units within 43 strategic business units [Slater, (2001), p.41]. GE accomplished this by developing rules along with fairly draconian incentives to make sure the flow of best-practice discoveries throughout the GE network occurred as fast as possible (Kerr, 2000). GE is a particularly important example since, with Welch as CEO, it has outperformed every major corporation around the globe in producing shareholder value (Byrne, 1998).

A preliminary analysis of the many actions by Welch, as recorded in Slater’s (2001) book, his management by tension, creation of agent heterogeneity, use of various devices to create effective network functioning, and wide-ranging distributed leadership are strong characteristics of his leadership approach. My hypothesis is that Welch was
effective because his approach was – albeit unknowingly and inadvertently – drawing strongly and consistently on basic theories and findings from complexity science.

Figure 1 GE stock chart (see online version for colours)

4 Complexity science as ‘order-creation science’

‘New Science’ is Wheatley’s (1992a) label for complexity science. To see how ‘New Science’ offers insight for organisational CEO-level leadership, I find it useful to divide complexity science into three phases. I define the first two here (I take up scalability – Phase 3 – later on):

- **Adaptive tension**: Phase 1 – the European School begins with the works of Prigogine (1955, 1997), Prigogine and Stengers (1984), Haken (1977), and then Cramer (1993) and Mainzer (1994), among many others. Their theory begins with the Bénard (1901) process – an energy differential is set up between warmer and cooler surfaces of a container (measured as temperature, \(\Delta T\)). In between the 1st and 2nd critical values \(R_{C1}, R_{C2}\), a region is created where the system undergoes a dramatic shift in the nature of fluid flow. For example, increasing the heat under water molecules in a vessel exposed to colder air above leads to geometric patterns of hotter and colder water – the chef’s ‘rolling boil’ emerges; new order appears. The critical values define the ‘melting zone’ (Kauffman, 1993; Stuuffer, 1987), within which new structures spontaneously emerge. Prigogine (1955) termed these ‘dissipative structures’ because they are pockets of new order – governed by the 1st Law of Thermodynamics (the conservation of energy law) – that speed up the dissipation of the imposed energy toward randomness and entropy according to the 2nd Law (Swenson, 1989).

- **Emergence**: Phase 2 – the American School – emphasises agent self-organisation absent outside influence. It consists largely of scholars associated with the Santa Fe Institute (Anderson et al., 1988; Cowan et al., 1994; Arthur et al., 1997). While
Phase 1 focuses mostly on dramatic environmentally imposed tensions that cause phase transitions at $R_{C_1}$ – the edge of order (instigated by what McKelvey, 2001, 2008, calls ‘adaptive tension’), Phase 2 complexity scientists focus mostly on $R_{C_2}$ – the ‘edge of chaos’ (Lewin, 1999; Kauffman, 1993). Focusing mostly on living systems (Gell-Mann, 2002), Phase 2 emphasises the spontaneous coevolution of entities (i.e., the agents’) in a complex adaptive system. Heterogeneous agents restructure themselves continuously, leading to new forms of emergent order consisting of patterns of evolved agent attributes and hierarchical structures displaying both upward and downward causal influences. Bak (1996) extends this treatment in his discovery of ‘self-organised criticality’, a process in which ‘tiny initiating events’ (Holland, 2002) can lead to complexity cascades of avalanche proportions. The signature elements within the melting zone – between $R_{C_1}$ and $R_{C_2}$ – are self-organisation, emergence and non-linearity. Kauffman’s ‘spontaneous order creation’ in this zone begins when three elements are present:

1. heterogeneous agents
2. connections among them
3. motives to connect – such as mating, improved fitness, performance, learning, etc.

Remove any one element and nothing happens. According to Holland (2002) we recognise emergent phenomena as multiple level hierarchies bottom-up and top-down causal effects, and non-linearities.

Both phases are important to my argument. Phase transitions are often required to overcome the threshold-gate effects characteristic of most human agents, i.e., resistance to change. This requires the adaptive tension driver to rise above $R_{C_1}$. Once an instigation event or tension occurs – what Holland (1995) calls the ‘tag’, broader coevolutionary dynamics may be set in motion. Neither $R > R_{C_2}$ nor tag-plus-coevolution seems both necessary and sufficient by itself, especially in social settings. This is why phase transition and coevolution are ‘co-producers’ (Churchman and Ackoff, 1950).

5 Twelve complexity-leadership A-Ds

“...Natural systems participate openly with their environment and complex structures emerge”

The foregoing quote by Wheatley (1992b, p.340), focusing on the connection between environment and emergent complexity – i.e., emergent new order – succinctly captures why Welch’s CEO approach worked so well and connects so well with complexity science. I outline 12 A-Ds based on key concepts from basic complexity science that I have some evidence suggesting were at the centre of Jack Welch’s management ‘discipline’ at GE. Each A-D stands as a complexity-based statement about how the basic themes of complexity science foster network and other developments in firms that, over some passage of time, eventually lead to vastly improved efficacious adaptation to complex and changing environments and performance in competitive conditions. I also take pains to show that each A-D reflects a Welch-style managerial focus that may be
induced from his managerial activities at GE. Slater (2001) is the main source of GE data supporting my view that each is a Welch-instigated phenomenon.

I argue that, collectively, these A-Ds are necessary and sufficient to produce CEO effectiveness. They do so because they give rise to effective management in complex, changing environments. The effective installation of these A-Ds serves to make firms and CEOs more quickly and efficaciously adaptive. These actions are the means by which CEOs can enable and steer their firms in ways that do not destroy autonomy, agent heterogeneity, connectivity, incentives, and emergent self-organisation without inadvertently creating an organisational culture dominated by top-down control and incentivised to carry out the CEO’s vision. In a real sense, these A-Ds represent complexity theory in practice. I argue that:

- many of these actions lie at the heart of Welch’s success at GE
- these actions are more apt to characterise effective firms in the 21st century than ineffective ones
- these actions represent the four key ingredients required to create complex adaptive systems on cellular networks: tension, heterogeneous agents, connections, and positive feedback.

Put simply, nothing boils down what many people do not like about Welch as CEO as much as:

1 the tension underlying ‘Be #1 or 2...or else...’ [Tichy and Sherman, (2005), p.114, somewhat paraphrased]

2 the divesting of units and ~130,000 employees gave rise to the ‘Neutron Jack’ label.

The first points to the Phase 1 tension dynamics of complexity science and my first four A-Ds. The second is a rather negative signification of the dynamics comprising Phase 2 – the remaining eight A-Ds – actions that produce change and novelty rather than Janis’s ‘groupthink’ (1972). When Phases 1 and 2 are combined, we see that without tension ‘phase-transition’ quality changes do not occur and without heterogeneous human capital and social networking skills imposed tension produces negative rather than positive returns. Together they act as what Churchman and Ackoff (1950) called ‘co-producers’.

5.1 A-Ds from Phase 1 of complexity science

I begin with the Phase 1 A-Ds. They stem from the European side of complexity science – Prigogine, Haken, Cramer, Mainzer, etc., – who focus on the role of the 1st critical value, \( R_{C1} \), of imposing energy in causing phase transitions. Welch’s ‘Be #1 or 2...or else...’ is an \( R_{C1} \)-equivalent action that caused ‘phase-transition-type’ new developments here and there throughout GE. While my first two A-Ds are quite straightforward in meaning and implication, A-Ds 3 and 4 are more difficult and problematic to understand and implement. No doubt, the tension A-D is the most broadly recognised as signatory of Welch’s management genius, but even so, the tension A-D would not have the same results without next three A-Ds, and, then, the first four would not gain much without the following eight.
1 Adaptive tension

Externally imposing and internally creating adaptive tension – see my earlier description of Phase 1 and the phase transition occurrences at $R_{C1}$ – which activate agents and sets off the creation of new order in the form of complex adaptive systems (McKelvey, 2001, 2008). Tensions are not goals (point attractors), but they serve as energising devices pushing people over the $R_{C1}$ phase-transition threshold for CEOs to take advantage of. Adaptive tensions may stem from any selectionist context – from outside a firm, from any higher level (or even lower levels) within a firm, or from more specific domains such as technology, markets, costs, competitors, political changes, etc. Absent tension, nothing happens:

- Welch’s ‘Be #1 or 2 or else…’ is the most obvious parallel here.
- Another phrase was ‘face reality’ [Slater, (2001), p.17] – i.e., the competitive context, which is where the important tensions come from. Welch put the ‘face reality’ at the top of his list.
- He very much possessed a ‘survival of the fittest’ mentality [Slater, (2001), p.49].
- He followed Clausewitz saying, ‘strategy was not a lengthy action plan. It was the evolution of a central idea through continually changing circumstances’. [Slater, (2001), p.29]
- Operating margins went from 10% before Welch to over to 17.3% in 1999.

2 Draconian incentives

My discussion here is mostly patterned after network incentives developed at GE, under the leadership of Welch (Kerr, 2000). The sub-rules that GE focused on for incentivising agents are:

- Agents are incentivised to focus on adaptive tension – the ‘Be #1 or 2…’. Challenge and ‘stretch’ (Tichy and Sherman, 2005) were also used to bring on tension effects.
- Agents incentivised to get information out on the network in a form abstract enough for all users to try out (Kerr, 2000); when he was Head of the Crotonville training centre, Kerr says he would get panicked calls from employees asking him how to do this!
- Agents gaining success in one part of the network, or with one kind of human capital, are moved to other positions – given additional ‘opportunities to fail’ (Kerr, 2000) – which is a way of building competence, diversity, and (inadvertently) weak ties.
- Agents incentivised to produce novelties, with the most critical (top priority) novelties expected at a consistent rate each year (say, five ‘most critical’ novelties per year) – novelties created in response to the prevailing contextual tensions and rates of change in the external environment.
• Agents incentivised to build learning cultures; transform learning into action; get learning and action to spread across layers and silos [Slater, (2001), p.70–74].

• Agents incentivised to ‘delay… get rid of fat… remove the boundaries, listen…’ etc. [Slater, (2001), pp.89–93].

• Agents are activated by the ‘A, B, C rules’ – people rated C are to be fired [Slater, (2001), pp.35–36]; a manager who cannot fire the Cs becomes one.

• Agents ‘above’ the cellular networks, such as CEOs, are incentivised to expect and review some specific number of ‘most critical’ novelties, and some novelties of lesser criticality without reservation – but note the ‘nearly decomposable’ rule in A-D #9.

3 Critical values

The edges of order and chaos ($R_1$, $R_2$), define the ‘region of emergence’ in complex adaptive systems (McKelvey, 2001, 2008). As Brown and Eisenhardt (1998) put it, below the *edge of order* bureaucratic behaviour prevails; above the *edge of chaos*, well, chaos prevails – there are so many degrees of freedom, so much variety, so many options, that selecting which forces to adapt to becomes problematic. Adaptive tensions cause phase transitions, (these are abrupt transitions to a new order), if the tension, $T$, is above the 1st critical value. Use of the 1st and 2nd *critical values* to define the *region of emergence* is critically important – below the 1st critical value, bureaucratic behaviour prevails; above the 2nd critical value, chaos prevails (Brown and Eisenhardt, 1997). Employee training and experience works to lower threshold gates (i.e., lowering resistance to change) so that adaptive tensions may take effect at lower values. Employees can also be trained so as to work in high-tension conditions without becoming dysfunctional because of chaotic conditions.

• For example, public utilities are notorious for having very high threshold gates before employees are apt to take innovative approaches. Worse, incentive systems do nothing to change this. In contrast, a reading of Slater (2001) on Welch’s ‘leadership secrets’ shows that Welch tried to create a corporation with a flavour very much the opposite of a utility.

• Welch emphasised draconian incentives that lowered employees’ threshold gates against networking, innovating, sharing, ‘exceeding goals’ [Slater (2001), p.131]; being a multibusiness enterprise was not an excuse for not spreading learning across boundaries – hence the book titled, *The Boundaryless Organization* (Ashkenas et al., 1995), which describes his efforts in this regard.

• The 1st critical value, which employees have to cross to reach the region of complexity, was lowered by the use of the incentives; the 2nd was raised by getting people more easily able to ‘stretch’ past normal levels of achievement to aim for higher levels, tougher goals, more difficult objectives without becoming dysfunctional (Tichy and Sherman, 2005).

• Welch said, “…people, excited by speed and inspired by ‘Stretch’ dreams, have an absolutely infinite capacity to improve everything” [Slater, (2001) p.133].
4 Attractor cages

Slater says, “Let’s keep in mind that the managers of American businesses have been trained to do just that – manage. That means managing, controlling, supervising, [and] creating corporate structures that assure that things get done” (2001, p.21). This leads to top-down control, passive dependency, and child-like behaviour by employees (Argyris, 1957). Everything that traditional leadership theory teaches managers tilts them toward trying to incentivise employees to carry out the leader’s vision (Marion and Uhl-Bien, 2001, 2003). In fact, Welch did it differently.

Welch gave subordinates opportunities to win or lose on their own. When some failed, he did not take over management; he just got rid of failing units and people. He used what complexity scientists call ‘attractor cages’ to do this. These cages define spaces within which unpredictable non-linear dynamics can be instigated to occur. For example, geology created the Galapagos Islands and Lake Victoria (the isolated cages) within which coevolution occurred – given the tension of finding food for survival on the islands and in the lake, a relatively few animals/fish (i.e., an attenuated gene pool) produced rapid genetic and ecological change.” The complexity phrase is ‘strange attractor limit setting’ plus the imposition of tension. How did Welch do this? There are four key elements:

1 Limit setting: for any particular ‘direct report’ subordinate, he created the cage by defining a few broad objectives, i.e., the business space (e.g., industry) within which this person needed to focus. Every once and a while the cage may need to be re-defined, especially in changing times.

2 Tension emphasis: from his first ten-year focus on ‘Be #1 or 2 in your industry…’ to his second ten-year focus on Six Sigma achievement, Welch insisted on make-or-break achievement, coupled with draconian incentives. This is ‘management by tension’ as opposed to ‘management by objectives’.

3 Within-cage point attractors: point attractors are goals or objectives that ‘direct-report’ subordinates decide are relevant targets for winning out over tensions imposed by the competitive context. Direct-reports set up the targets and then manage the negative feedback process to reward or punish subordinates who do or do not reach the target. The Welch ‘challenge’, so to speak, was for each direct-report to, then, set up his/her own point attractors within the cage – i.e., specific goals, targets, etc., to be achieved within the specified time limit. With some 350 businesses within the GE complex, Welch could not just reach down and do this level of ‘management’ himself, as the quote from Slater, above, implies.

4 Coevolution and scalability: discussed as A-D #11.

By doing the above, CEOs can create ‘cages’ within which coevolution and new order can emerge and progress. Welch did not create the specific goals (point attractors) himself; this is what the direct-report subordinates in the attractor cage had to do. The idea of leaders enabling and steering complexity development – but not reaching down to do it themselves – is at the heart of the recent papers on complexity leadership by Marion and Uhl-Bien (2001, 2003) and Uhl-Bien et al. (2008). From Slater’s book we see that:
• Welch defined attractor cages by emphasising ‘a few clear, general goals’ and ‘broad objectives’ [Slater, (2001), pp.28, 30].

• Welch said, “manage less…instil confidence…get out of the way…emphasise vision, not supervision” [Slater, (2001), p.22]; “managing less is managing better” [Slater, (2001), p.18].

• But like the strange attractor, there is a point where clarifications and corrections may need to be inserted. Thus, Welch pursued ‘strategic audits’ [Slater, (2001), p.45] and downsizing as ways of maintaining focus.

• Welch managed by imposing process-incentives, not content-directives.

5.2 A-DS from Phase 2 of complexity science

The A-DSs from Phase 2 of complexity science mostly pertain to the development of employees’ knowledge, skill, and networking capabilities coupled with positive-feedback aspects of evolution and change. These A-DSs connect with the directive given by Collins in his book, *Good to Great* (2001, p.47): ‘Get the right people on the bus’. This becomes the task of building human capital (Becker, 1975) and social capital (Granovetter, 1973; Burt, 1992). These A-DSs fit with Welch’s constant attempts to create a ‘boundaryless organisation’ (Ashkenas et al., 1995) and put people and their development first (Sirisha, 2002).

5 Heterogeneous agents

If all the agents have similar abilities, there is no advantage to networking (Holland, 1995). End of story. Relevant synonyms are ‘diversity’, unlike’, ‘novel’, ‘randomness’. In complexity science, agent heterogeneity is the opposite of Janis’s ‘groupthink’ (1972). We have some 3.8 billion years of mutation and crossover creating biological diversity to support this. Campbell (1974) called it ‘blind variation’, arguing that ‘blind’ variation was much more relevant for social innovation than ‘rational’ variations. Furthermore, Johnson (2000), LeBaron (2000), Allen (2001), and Page (2007) all show that novelty, innovation, and learning disappear as the attributes of agents collapse from heterogeneous to homogeneous. The definition of creativity favoured by psychologists – ‘remote associates’ – holds that creativity emerges when agents having different ideas or concepts interact and, consequently, are joined to produce something new (Mednick and Halpern, 1962).

• In the first ten years or so after Welch took over GE (his ‘Neutron Jack’ era), he divested ~130,000 of its 400,000 employees and acquired ~70,000 [Slater, (2001), p.99].

• This effort brought together employees with diverse experience and abilities (as compared to the long-term GE employees).

• This heterogeneity was brought in by acquisitions; consequently, it had more impact because it came in the form of the 993 newly acquired groups of people, each of which had more impact than lone individuals.
6 Build human capital

Human capital is the basis of agent heterogeneity. The idea of networked idiots does not offer much promise. The ‘human capital’ idea dates back to Becker’s (1975) work on the subject. He argued that the economists’ Cobb-Douglas production function needs a component to reflect the knowledge people hold, as well as capital and labour. This is especially true in today’s knowledge economy. In some sense, the economic advantage of the USA, today, is much more a function of human capital, and its embodiment in physical and intangible capital, than financial capital or cheap labour. Zucker and Darby (1996) find that one genius appropriately networked is superior to larger networks comprised of less talented agents. Isolated geniuses are not any better than networked idiots!

The ‘absorptive capacity’ literature (Cohen and Levinthal, 1990) suggests that if agents do not have some pre-existing level of knowledge relevant to understanding imposing ‘variety’ from the environment (Ashby, 1956), they will not be very good at collecting additional information pertaining to the imposing contextual adaptive tensions. Also, absorptive capacity is a positive feedback process – the more absorptive capacity an agent has the more new, technical information he/she absorbs; the more information absorbed, the higher his/her absorptive capacity.

- As he hired more diverse employees (heterogeneous agents), Welch also added to the human capital of GE. However, the employees were not chosen and placed randomly in the corporation (one way of bringing in heterogeneity). Instead, they arrived as employees of acquired businesses, meaning that their human capital was relevant and already integrated into some kind of already working network. The acquired businesses had the trust/cohesion/efficiency advantage of groupthink, but as a result also had more heterogeneity clout. GE under Welch was able to take advantage of the ‘heterogeneity clout’ without destroying the ‘groupthink trust/cohesion/efficiency’ – unlike most of M&A practices by most firms, which destroy both.

- Because of GE’s ability to assimilate (they were successfully bringing in around three to five acquisitions per week (Kerr, 2000), the newly acquired human capital units retained their ‘groupthink’ effectiveness and yet had significant heterogeneity impact, thereby improving the overall productivity of GE.

- As Slater (2001, p.59) characterises, Welch used ‘acquisitions to make the quantum leap’.

7 Weak tie flooding

Granovetter’s (1973, 1982) classic research finding is that novelty and innovation happen more frequently in networks consisting of ‘weak ties’ as opposed to ‘strong ties’. The latter tend to produce groupthink (Janis, 1972). This weak-tie effect is reconfirmed by Burt’s (1992) discovery of the entrepreneurial power of ‘weak-tie bridges’. And, of course, weak-tie effects go hand in hand with my 5th action-rule’s emphasis on agent heterogeneity. Given an existing system, which tends toward strong-tie formations as agents get to know each other better and experience the build-up of what McKelvey (2003, 2010) terms ‘entanglement ties’ – path dependencies resulting from ties building
up over repeated interactions, with the effect that the behaviours of entangled-tie agents become increasingly similar and predictable (see also March, 1991). While modularisation speeds up adaptive response rates, modules (cells) are also prone to become strong-tie cliques. Put in terms of Burt’s weak-tie bridging, weak-tie flooding is even more effective when bridging activities are included. The positive effects of weak-tie flooding appear in Uzzi’s (2001, Guimerà et al., 2005) study of the evolution of the Broadway music industry.

- Welch set the stage for weak-tie flooding by divesting units totalling ~130,000 employees and then acquiring firms to bring back ~70,000 [Slater, (2001), p.99–100].
- While acquired firms may enter with strong-tie networks within firms, they immediately have weak-tie potential across all the rest of the business units.
- Coupled with the physical proximity A-D, the flooding of GE with weak-tie effects was inevitable.
- I have already mentioned GE’s emphasis of networking.

8 Moderate networking

Kauffman (1993), in an important book in the evolutionary biology literature, argues that some connections – not very many, actually – among agents improves system fitness. However, this fitness deteriorates as the number of connections among agents increases past an optimal level. He calls this effect ‘complexity catastrophe’, arguing that it thwarts Darwin’s (1859) selectionist evolution-toward-improved-fitness theory. Using his NK[C] model, Kauffman also finds that the upper bound at which ‘catastrophe’ sets in is raised if agents within the system are connected to a moderate extent with agents outside the system (McKelvey, 1999). To this end, Barabási and Bonabeau (2003) find that number of connections per node follows a power law, so it should be expected that one individual in a network will have many links and some will have almost none. In other words, it is not necessary that all agents have the same number of connections (Yuan and McKelvey, 2004). Moderate complexity is confirmed by the research of Rivkin (2000, 2001), among many others (Maguire et al., 2006; Levinthal and Posen, 2007; Ganjo and Agarwal, 2009) parallel to Simon’s (1962) ‘nearly decomposable’ systems, as I note below.

- Welch set in motion a number of network producing ideas – the ‘work-out’ process got employees to talk to each other and then to the boss (Slater, 2001); the ‘no hording of best practices’ forced people to get their ideas into the GE network of idea circulation (Kerr, 2000).
- The yearly meetings in Boca Raton, Florida brought managers from all parts of GE together in ways that developed weak-ties across organisational units; the acquisitions brought new people in who were already in networks – stronger ties within acquired units; weak ties among units.
- At the same time, there was no sense of massive required networking that would bring on ‘catastrophe’.
• Moving people who have succeeded in one job into another – that is, changing their job position and physical location is a way of creating new weak-ties, as GE has found out (Kerr, 2000).

9 Modular design

How can corporations create ‘cells’ in cellular networks? Simon (1962) argued that systems (i.e., cellular networks) evolve toward fitness fastest when the cells (modules) are nearly, but not totally, disconnected from higher levels in biological or social system hierarchies – i.e., ‘nearly decomposable’ into anarchy. Sanchez (1999; Sanchez and Mahoney, 1996) confirms this empirically in his extensive research on the effectiveness of modularly designed firms; also corroborated by Schilling (2000). Economists have long argued that one has to worry whether managers (or autonomous agents) always serve the best interests of shareholders. It is clear from the recent Enron, WorldCom, and investment bank investigations that CEOs and lower-level managers do not always put shareholder interests first. Even so, it is clear that the alternative – of strong top management control – is also antithetical to shareholders’ best interests. CEOs have to aim at giving cellular networks much freedom and autonomy, but not total autonomy. I also dealt with this earlier in the ‘attractor cages’ section.

• Welch tried to get GE to think small, and ‘act like a small company’ [Slater, (2001), p.99].

• He did away with several layers of management. He ‘unleashed empowered workers’ [Slater, (2001), p.100]. Getting rid of layers of hierarchy, while at the same time focusing on worker empowerment and autonomy, is consistent with Simon’s near decomposability. By doing this, Welch’s emphasis was on adaptive speed.

• He held that small business units ‘communicate better’, ‘move faster’, and ‘waste less’ [Slater, (2001), pp.100–101], again fitting Simon’s evolutionary advantage from near decomposability.

• Welch said: “We found that with fewer layers, we had wider spans of management. We weren’t managing better. We were managing less, and that was better” (p.18).

10 Appropriate physical proximity

People who see each other all the time usually develop strong ties. People who never see each other tend not to interact. This is to say, networking is a function of physical adjacency. Of course, the internet, electronic mail, telephones, and so forth, overcome many limitations of physical adjacency, but many remain. Therefore, it is important to create physical ‘mixing’ events that bring heterogeneous agents into person-to-person contact. Combining these mixing events with increased awareness of newly appearing adaptive tensions meets some of the basic conditions of new order creation, as outlined in McKelvey (2001, 2008). CEOs can also create tags (tiny initiating events), which serve to set off coevolutionary dynamics. Job related ‘new’ mixing is also possible. GE used physical circumstances to foster appropriate internal complexity.

• The training facility at Crotonville was a key place for ‘work-outs’ (Tichy and Sherman, 2005). Whether at Crotonville or in a hotel, employees spent some three
days away from GE in a physical location where they could first talk to each other and then, at the end, to their boss.

- Frequently, diverse members of a particular business were brought together – engineers, production, marketing, etc. [Slater, (2001), pp.117–122].
- Yearly meetings in Boca Raton were larger events where 500 managers from all 350 businesses of GE would congregate and attend sessions of various kinds [Slater, (2001), p.35]. Here, the physical setting was the key in making network development and weak-tie formation possible.
- The work-outs were about confronting the boss, while the Boca Raton meetings were platforms for Welch to repetitively re-emphasise the broad objectives to all the key players (i.e., keep defining/redefining the boundaries of the attractor cages)
- Underneath these overt agendas, the physical sites fostered making weak-tie connections and networking.

11a Coevolution

Coevolution is a fundamental dynamic in Phase 2 of complexity science. From biology, two key points are relevant:

1 Coevolution implies heterogeneous agents (genes), erosion of barriers so gene pools mix, and the interaction of species and habitat elements such that they constantly impose on each other to create adaptive tension.

Even so:

2 Coevolution is kept under control by damping mechanisms such as food stocks, climate, geology, diseases, and predator-prey relationships; organisms have no control over the rate at which they progress toward new order.

Evolution and ecology have long been part of organisation theory (Aldrich, 1979, 1999; McKelvey, 1982; Hannan and Freeman, 1989) with coevolution a more recent arrival (McKelvey, 1997; Lewin and Volberda, 1999). These treatments leave explicit managerial actions out of the mix. But, in organisations, as McKelvey discusses elsewhere (2002), coevolving systems are always liable to coevolve in unwanted directions, not coevolve fast enough in the right directions, start at a good rate and then suffer the effects of damping processes, etc. As a result, coevolution has to be explicitly managed.

- “Welch was convinced that GE’s diversity and complexity could be turned into an asset by creating what he called ‘a learning culture’” [Slater, (2001), p70].
- “The boundaryless learning culture killed any view that assumed the GE Way was the only way, or even the best way” [Slater, (2001), p.72].
- “That belief drove us to create a boundaryless company by de-layering and destroying organisational silos. Selflessly sharing good ideas, while endlessly searching for better ideas, became a natural act. We purged NIH – not invented here – from our system...” [Slater, (2001), p.73].
Breaking down boundaries and emphasising idea sharing surely set coevolution in motion at GE. Thus: “Our core competence is sharing best ideas across businesses…. Reward employees for knowledge sharing…. Hold idea sharing meetings on a regular basis” [Slater, (2001), pp.78, 80].

11b Scalability

Tiny initiating events can spiral up (scale up) into large positive or negative outcomes (Holland, 1995, 2002; Newman, 2005; Andriani and McKelvey, 2009). Sam Walton’s first store scaled up into Walmart. The Harvard student, Billy Gates, had an idea about personal computer file-management that scaled up into Microsoft. Oppositely, a variety of small localised traffic stoppages on the Union Pacific railroad after its merger with the Southern Pacific railroad, eventually accumulated to the point of shutting down the entire 30,000-mile railroad (Weick and Sutcliffe, 2001); similar build-ups of random tiny events eventually brought down Enron and Wall Street’s Bear Sterns and Lehman Bros.

Good management fosters the positive scalability spirals; stops negative ones. Scalability requires heterogeneous agents, erosion of barriers so ideas mix, and the interaction of agents in and outside of firms such that they constantly impose on each other to create adaptive tension. Welch’s management by tension, and then boundaryless organising coupled with coevolution, set scalability in motion. The best example is his switch from using ‘Be #1 or 2…’ as an adaptive tension in the first ten years at GE (which forced managers to study and respond to their outside competitive context), to his strong emphasis on Six Sigma in the second ten years (which involved managers from top to bottom). Six Sigma is scalability in action (though inadvertently). Why? For Six Sigma to work it had to have strong top management support (Welch heavily incentivised top managers who made Six Sigma work), down through middle management and, then, down to basic operations where quality improvements were made in all basic production processes from GE capital to places where they manufactured things like parts for locomotives, jet engines, and MRI equipment.

- Six Sigma was applied to manufacturing and then to all service-related transactions as well [Sirisha, (2002), p.5].
- 40% of the bonuses for 7,000 top executives were based on Six Sigma performance: [Sirisha, (2002), p.5].
- Operating profit margins increased from 13.6% to 16.75 in 1999 [Sirisha, (2002), p.5].
- Customer satisfaction was made top priority across all management levels [Sirisha, (2002), p.6].
- Six Sigma forced managerial attention from top to bottom on tiny events defined as three defects per million [Slater, (2001), p.155].
- These then translated into cost of poor quality, supplier quality, internal performance, and design activities [Slater, (2001), p.155].
12 Coaching

The OD literature (French and Bell, 1984) and researchers applying complexity theory to business both realise that coaching is needed to help many employees form network connections expeditiously (Goldstein, 1994; Kelly and Allison, 1999). One cannot assume that all relevant employees arrive with networking skills. Given the possibility of both personal and task conflict, there is every reason to expect that coaches need to act as catalysts to help networking along.

- At GE professional ‘facilitators’ were used to make sure the work-outs worked (Slater, 2001).
- A compelling discussion of the coaching process is given in the ‘Crotonville’ and ‘work-out’ chapters (#s11 and 16) in Tichy and Sherman (2005).

6 Why believe complexity science rather than what is in all the ‘Welch’ books?

From opera stars to athletes, people ‘born with it’ or who are instinctively good at it are often not good at telling others how to do it. In contrast, ‘average’ players like Tommy Lasorda (long-time coach of the Los Angeles Dodgers baseball team) often become genius coaches (because they have to study the game to get better at it). Jack Welch is an instinctively great manager, but I do not think he is very well clued in on the action-specifics of how he got GE to be so remarkable. I do not think any of his books, or any other writings about his accomplishment, convey the right message. This explains why none of his protégées has replicated his amazing results in any other non-startup firm – they see results of what he did, but cannot replicate it. Bill Gates created an incredible Microsoft, which is its own story. But it is vastly different from a 100 year-old, old-line manufacturing company making mostly commodity-like products.

Recently, Fortune Magazine published an article titled, ‘Get me a CEO from GE’ (Kratz, 2005). The nature of this title suggests two things: other firms looked to GE to find their CEO and CEO-recruitments from GE were presumably good choices during the Welch era. Kratz mentions that 34 CEOs came from GE. In her story she mentions a number of CEOs who did or did not do well as CEO. She also crystallises these CEOs’ perceptions of what they learned from Welch [Kratz, (2005), p.3]; if not the playbook, the key tools are:

- ‘increase revenues and cut costs at the same time’
- Welch’s ‘one key device…was giving GE a simple roadmap and repeating it incessantly’
- ‘I don’t want you to call it a playbook…they’re just tools’
- ‘an absolute belief that great people build great companies’
- Matt Espe (CEO at IKON) boils this down to this: ‘build a house that builds people’.

So, what kinds of shareholder value came from these ‘tools’ used by GE-trained CEOs? Of the various GE-trained CEOs mentioned by Kratz, only two of the 34 who left GE to
become CEOs get star ratings. The first is Larry Bossidy while he was at AlliedSignal (which became Honeywell); his favourite term is ‘execution’ – but not the people! (Bossidy and Ram, 2002). During the nine years he was CEO the stock went up around 117%/year from start to finish (includes two stock splits). Below is the Yahoo stock chart. Still, while Bossidy was the best of those who left, his stock chart in no way looks as good as Welch’s – under Welch GE stock went up ~345%/year and with five stock splits!

**Figure 2**  Larry Bossidy’s performance at Allied Signal (became Honeywell in Dec. 1999)  
(see online version for colours)

**Figure 3**  Jim McNerney’s performance at 3M (see online version for colours)
The second best CEO from GE is Jim McNerney. During his five years at 3M we see nothing but strong positive gains in stock value; he clearly brought the lagard 3M stock to life; the change in rate of value increase is dramatic. He then left 3M to take over Boeing after the dismal performance of another GE-trained CEO, Harry Stonecipher (‘cipher’ is a pretty apt description of his performance). McNerney built on the stock jump at the end of Stonecipher’s tenure and continued Boeing’s dramatic stock rise – until it all came to a halt because of the liquidity crisis and crash of Wall St. in August 2007 – I do not hold him accountable for the liquidity-caused decline. Another GE-trained CEO, Steve Bennett, brought a 500% stock improvement to Intuit. Of the 34 GE-trained CEOs only these three CEOs show un tarnished positive stock gains for their firms – again, only three out of 34. But none as good as Welch.

**Figure 4** Jim McNerney’s performance at Boeing (see online version for colours)

**Figure 5** Steve Bennett’s performance at Intuit (see online version for colours)
Tom Tiller was CEO of Polaris from 1998 to 2005. Its stock shows a strong positive rise up to 2005, but then collapses two years before the August 2007 liquidity crisis. A similar picture describes results from Randy Hogan at Pentair – strong positive showing but then a crash starting in 2005, a boom year. While John Trani at Stanley Works does not end a his stint with a crash, he shows only around a 100% increase in stock value in eight years – a modest performance indeed, given that the declines in Stanley Works stock were independent of the dot.com bust starting in 2001.

Figure 6  Tom Tiller’s performance at Polaris (see online version for colours)

Figure 7  Randy Hogan’s performance at Pentair (see online version for colours)
On the decidedly negative side, no well-known GE-trained CEO matches Bob Nardelli, who ran The Home Depot into the ground over seven years. He stopped a rising stock dead in its tracks. Unless it is Jeff Immelt, who has been CEO of GE while its stock value has almost disappeared – see Figure 1. Almost as negative as Nardelli was the tenure of Kevin Sharer at Amgen. Like Nardelli, Glen Hiner and Gary Wendt rode down into oblivion with their stocks at Owens Corning and Conseco. Stanley Gault gets positive regards for his eleven years running Rubbermaid, but in fact the stock skyrocketed immediately after he left.

Figure 8  John Trani’s performance at Stanley Works (see online version for colours)

Figure 9  Kevin Sharer’s performance at Amgen (see online version for colours)
Figure 10  Bob Nardelli’s performance at The Home Depot (see online version for colours)

*Bottom line:* Kratz (2005) points out that 17 of the 34 GE-trained CEOs performed worse than the S&P. Of the 17 who supposedly performed better, first, being better than the S&P is hardly noteworthy. Of all the CEOs she mentions, stock performance indicates that only Bossidy and McNerney show strong positive performances. But even they are nowhere near the outstanding results Welch accomplished. It is very clear from the record that none of the GE-trained CEOs came close to Welch’s performance over his 20 years heading up GE. Most lasted no more than half the time with nowhere near his level of accomplishment.

7 A-Ds used by non-GE-trained CEOs

The foregoing section focuses on GE managers who left to become CEOs, and as the record shows, only two, Bossidy and McNerney, have strong records. Evidence suggests that Jack Welch’s methods mostly did not pass down to his subordinates at GE. My argument is that this is because he was unaware of – and no one else learned about – how he was inadvertently putting the 12 A-Ds of complexity leadership into practice. But what about evidence about the use of the A-Ds by people not connected with GE, but who have outstanding records as CEOs?

For the past two years I have had a variety of student teams focusing their term papers on analyses of famous CEOs associated with high-performing firms or well-known turnaround events. I challenged students to find out which of the A-Ds were used and whether all 12 were really necessary for stellar results. As one may see from Table 1, Google, Herb Kelleher at South West Airlines, Michael Dell at Dell, and Sandy Weill at Citigroup are/were using all or most of the A-Ds. Lou Gerstner used six of them when revitalising IBM. Vikram Pandit’s precarious position of being ‘about to be fired’ at Citigroup over the past three years is due to his being the worst performer in the table, in terms of A-D use. It is interesting to see that Gerstner and Steve Jobs are high on most of the same A-Ds. One should know that when Jobs heads up Apple its stock goes up; when he is not CEO it stock flattlines.
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<th>Google</th>
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<th>Yahoo</th>
<th>IBM*</th>
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Notes: 
1: comparisons done with the help of student researchers; Spring 2008, 2009.
2: rewards for entrepreneurial results rather than 'Draconian' as in GE.
3: A-Ds the research Team thinks Vikram Pandit (current CEO of Citigroup) needs to focus on first – generally, all A-Ds appear to be missing at Citigroup.
4: Yahoo gets partial credit for these A-Ds.
5: A-Ds Lou Gerstner appears to have paid attention to when creating the company-saving turnaround at IBM.
6: tension in terms of income, margins, ROI, as opposed to Welch's market share.
7: very strong 'Kellerer' culture; 90% of workers in 9 Unions - strong union culture.
8: people as 'modules'; Porter's complexity 'fit-locks'.
9: tension via Steve Jobs personality rather than tension by imposing 'stretch' objectives.
10: the arrow L→H indicates the style of management before Michael Dell returned to his firm and then the management style Dell is known for.
11: Sandy Weill is mostly responsible for creating Citigroup by merging Travelers Ins. with Citibank (after John Read retired). Citigroup 'crashed' after Weill retired.
12: Tata Group now has major world-wide brands; resurrected/reconfigured by R. N. Tata in 1991: 4=full emphasis of the A-D; 3=3/4 emphasis; 2=half emphasis;
13: little emphasis of the A-D.
14: Jeff Immelt took over as CEO of GE after Welch retired; started in 2001, the time of the dot.com bust. GE stock has lost most of its value since then, even though Immelt is high on half of the A-Ds.

Table 1: A-Ds used by non-GE-trained CEOs
As one may see, the ordering of the A-Ds in the table is out of sequence. At the top, I have placed the A-D used most often. The least-often used A-D is at the bottom. This ranking is definitely not what I would recommend in terms of what to do first – but at least heterogeneous agents is 2nd and tension and critical values are 4th and 5th. It is interesting and important that weak-tie flooding is 1st, since that is what most quickly increases heterogeneity – so this is highly logical, very important and good to see. The attractor-cage concept is the most difficult for students to understand, which undoubtedly affects its use, and thus ranking. In working with Staff personnel at a world-famous DJI firm, I see that draconian incentives is a difficult management practice for many people to feel comfortable with which, then, lowers its ranking. Most worrisome, perhaps, is that managing coevolution (and scalability) is at the bottom. Getting top quality management practices to filter down, and good ideas to filter up appears to be outside the range of thinking of CEOs and firms of top quality. One caveat, however: The student researchers only had access to ‘outside the firm’ books, articles, news reports, and other stories and commentaries attempting to describe what goes on inside these firms. These sources cannot be considered to be totally comprehensive in terms of offering useful insider information about all, and perhaps even any, of these A-Ds.

8 Conclusions

Leadership theory is still mostly stuck at the bottom of hierarchies (the ‘supervisor’ level); it is mostly about how ‘heroic or charismatic’ superiors [Bennis, (2007), p.3], who have ‘wisdom, intelligence, and creativity’ [Sternberg, (2007), p.34] should ‘lead’ followers in a face-to-face context. While they say the foregoing are still appropriate, Marion and Uhl-Bien point out that leadership also involves “…creating the conditions that enable productive, but largely unspecified, future states” (2001, p.391, my italics). Brown and Gioia (2002) say that “…leadership is not solely a set of characteristics possessed by an individual, but an emergent property of a social system, in which ‘leaders’ and ‘followers’ share in the process of enacting leadership” [quote taken from Parry and Bryman, (2006), p.455, my italics].

Taking a fresh start, I try to learn from what Jack Welch actually did at GE:

1. to increase its stock value 1,000s of percentage points higher than the Dow Jones Stock Index
2. to stay in office for 20 years at a time when Lucier et al. (2005) refer to CEOs as ‘temp workers’
3. produce some $480 billion in shareholder wealth
4. be identified as ‘Manager of the Century’ by Fortune Magazine.

But this is not easy. From opera stars to athletes, people ‘born with it’ or who are instinctively good at it are usually not good at telling others how to do it. Welch is an instinctively great manager, but I do not think he is very well clued in on the action-specifics of why he did so well. This explains why none of his protégées has replicated his amazing results in any other non-startup firm – as the stock charts in this article indicate.

What did Welch actually do? I draw from complexity science to identify 12 A-Ds that I believe are the means by which Welch was able to enable and steer GE to
produce incredible wealth in ways that did not destroy social and human capital, autonomy, agent heterogeneity, connectivity, incentives, complex adaptive systems dynamics, and emergent self-organisation – and all without inadvertently creating an organisational ambiance/culture dominated by top-down control and/or imposing a CEO-only vision. These A-Ds represent complexity theory put into practice. But, my stock-chart data show pretty clearly that most of the Welch protégées trained at GE – who left to become CEOs of other firms – did not do very well; they just did not get the right message about how and why Welch produced so much shareholder value. In contrast, I try to offer some evidence that other CEOs who have built well-performing firms or produced dramatic turnarounds did, in fact, use many of the A-Ds.

A key question remaining, however, is whether all 12 A-Ds are necessary. My logic says yes, but my student researchers did not find this to be true in their studies of outstanding CEOs/firms. My Table 1 shows that a number of CEOs of top-performing firms did not use all 12. If not all 12 are used, is there a critical subset that must be used? Gerstner appears to have used just six in his turnaround of IBM. But my student research teams may not have gotten access to all of the relevant data, given that they were using published materials and studying firms from outside in.

Second, there was clearly a tough side to Welch’s leadership at GE. He was not called ‘Neutron Jack’ for nothing. Divesting 130,000 employees is not for the weak hearted. Labelling employees As, Bs, and Cs and then firing the Cs, and then firing the managers who cannot fire the C’s, is surely tough minded. The ‘Be #1 or 2…” rule is not for the weak hearted either. On it goes. In contrast, many introductions of complexity theory to practitioners have been on the soft side, like much of OD – translating self-organisation into a modern version of empowerment, using complexity sciences as a modern-day re-legitimisation of prosaic OD approaches (I will not say who). My A-Ds make it patently obvious that ‘complexity in action’ is very different from updated OD. Saying ‘Be #1 or 2…” is meaningless absent the threat of divestiture and losing one’s job. Welch was tough and had a vision, but clearly avoided the Nardelli kind of top-down control that thwarts innovation, stops risk-taking, stops two-way communication, and builds strong-tie defensive cliques rather than weak-tie networks. Put bluntly, Welch replaced old-style, top-down ‘management by objectives’ by ‘management by tension’. This is complexity leadership at its best!

To bottom-line it: I define 12 the A-Ds that Jack Welch pursued incessantly, as corroborated by the various quotes and statements I draw from Slater’s book, Get Better or Get Beaten (2001). These 12 A-Ds encapsulate four critical elements – tension, heterogeneous agents, connections, and scalability – that complexity scientists have found give rise to complex adaptive systems, of which GE is a good and very large example. Using stock-charts as data, I also show that only two of the 34 GE-trained CEOs were in anyway successful – and none anywhere nearly as successful in creating shareholder value as was Welch. Finally, I show that six or more of the A-Ds appear to figure importantly in the success of various well-known CEOs showing remarkable success, but who have no connection with GE. All said and done, this article:

1 outlines the principal elements of complexity leadership

2 shows that traditional leadership theory offers no explanation at all for Jack Welch’s incredible success as the 20-year CEO of GE.
References


Notes

1 A ‘cell’ is a team, department, strategic business unit or firm. A ‘cellular network’ has to be able to ‘reorganise continually’; requires collaborative skills for making cross boundary linkages; requires ‘entrepreneurship, self-organisation, and member ownership’ [Miles et al., (1999), p.163].

2 Figures 1 through 10 are ‘Reproduced with permission of Yahoo! Inc. ©2009 Yahoo! Inc. YAHOO! and the YAHOO! logo are registered trademarks of Yahoo! Inc.’ (quoted from an e-mail from Yahoo Permissions).

3 ‘Agent’ is a term broadly used to refer to cells, organisms, species, conversation elements, people, employees, groups, firms, industries, and societies, among many other more specific definitions.

4 My original term was ‘simple rules’, which comes from computational modeling and Epstein and Axtell’s book, *Growing Artificial Societies* (1996, p.6). Computational agents follow ‘simple rules’. But Welch’s complexity leadership actions require consistent application over time, and they are not really ‘simple’. Various readers have suggested that ‘action-disciplines’ is more apt. Hence, ‘complexity-leadership action-disciplines’.

5 A-Ds 1, 2, 3, 4, and 5 are further elaborated in McKelvey (2008).

6 For background on Clausewitz, see von Ghyzy et al. (2001).

7 Darwin (1859) described what happened on the Galapagos Islands and Chu et al. (2003) do so about Lake Victoria.

8 Weak ties are typically defined as connecting ‘once a year; strong ties are connections ‘once a week’.

9 A power law is a Pareto distribution plotted on log X and Y-axes. A Pareto distribution is usually a rank frequency distribution with long tails; thus, Barabási and Bonabeau find that most members of a network are loners and one social star is usually at the top, having many more network connections than any other node. Andriani and McKelvey (2009) list 101 studies of power-law rank/frequency social and organisational distributions.
For a recent critical review of the NK model applications to organisations, see McKelvey et al. (2009).

Scalability is part of the 3rd ‘Econophysics’ phase of complexity science. It dates back to the fractals of non-linear dynamics and chaos theory (Schroeder, 1991), and then power law studies (see endnote no. 8) (Newman, 2005; Andriani and McKelvey, 2007) and most recently scale-free theory (Andriani and McKelvey, 2009).