



Temporal leadership

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Abstract *The situation with Enron illustrates that leaders have been tempted to stretch their company's image of growth and success beyond acceptable limits. Even with the best intentions, leaders keep their organization in a stranglehold by reinforcing behaviors that match their comfort zone. However, when these behaviors no longer respond to the needs of an organization, leaders should face up to the limits of their rule. In fact, leadership should become much more sensitive to the temporal (time-related) needs of companies and their organizations. How does this affect the qualities of leaders? Does leadership style bring resolve or is it something else? And, what kind of a leader are you? A conceptual framework is needed as much as a practical approach. In a holistically learning organization, leadership, in its broadest sense, must accept the existence and limits of so-called temporal comfort zones. In fact, an adequate management process requires the adoption of a triple-loop learning process.*

As a result of management debacles on both sides of the Atlantic, leadership is on the top of the corporate agenda. Keeping a finger on the pulse of leaders has been difficult, if not impossible. What determines the behavior of leaders, and how can it be recognized? It is time to explore the ethos of leadership in more detail.

During a decade of exceptional growth, companies enjoy the morning sun. Some leaders excel in raising capital. Others develop new market niches. And, yet others focus on the expansion and/or improvement of the business.

But from the moment that growth is on the decline, the journey toward a New Economy, which Greenspan inspired, suddenly changes into a life-threatening expedition.

The situation with Enron and also other companies shows that many leaders have stretched beyond acceptable limits the image of growth and success. Allegedly, these leaders did so to influence favorably their company's share price and the related bonus schemes.

But even with the best intentions leaders sometimes keep their organization in a stranglehold by reinforcing a behavior that matches particularly their own comfort zone. From the moment that this behavior no longer responds to the needs of an organization, however, leaders should actually face up to the limits of their rule and call an end to their reign.

Unfortunately, the course that leaders set out for their company is often challenged only when unexpected external or internal events take place. And only then, the necessary (but not sufficiently acknowledged) adaptation of behavioral rules, which effectively determine the make up of an organization, gets a chance to inspire another kind of leadership.

In actual fact, the notion of leadership should become more inclusive when it comes to the temporal or time-related needs of organization. After all, as recent events confirm, leadership not only determines the fate of an organization but, eventually, an organization also determines the fate of the leader.

So, how will the above observation affect the governance of a company and, in more general terms, the notion of leadership?



The answer to this question calls for a more coherent insight into the development of organization.

Leadership and fundamental stages of company development

The development of a company or organization can be summarized in four distinct stages, i.e. the exploration stage, the niche-nurturing stage, the expansion stage, and, lastly, the confrontation stage[1]. The confrontation stage is followed in turn by a stage of discovery or, rather, rediscovery.

These stages have been derived from processes that contribute to the evolution of an organization as a complex self-organizing whole. Examples of these processes are the accidental emergence of behavioral rules, the natural selection of behavioral rules, and the gradual adaptation and refinement of behavioral-rule species[2].

The discovery stage

In the discovery stage (Figure 1: top-left quadrant), the leader fulfills the role of an entrepreneur (or, in established organizations, stimulates the role of internal entrepreneurs) as he searches for new business concepts that can trigger a new cycle of corporate growth. Colonel Sanders, who has just been retired, exemplifies the qualities of such a leader. Passionate about a way of preparing chicken with a crusty

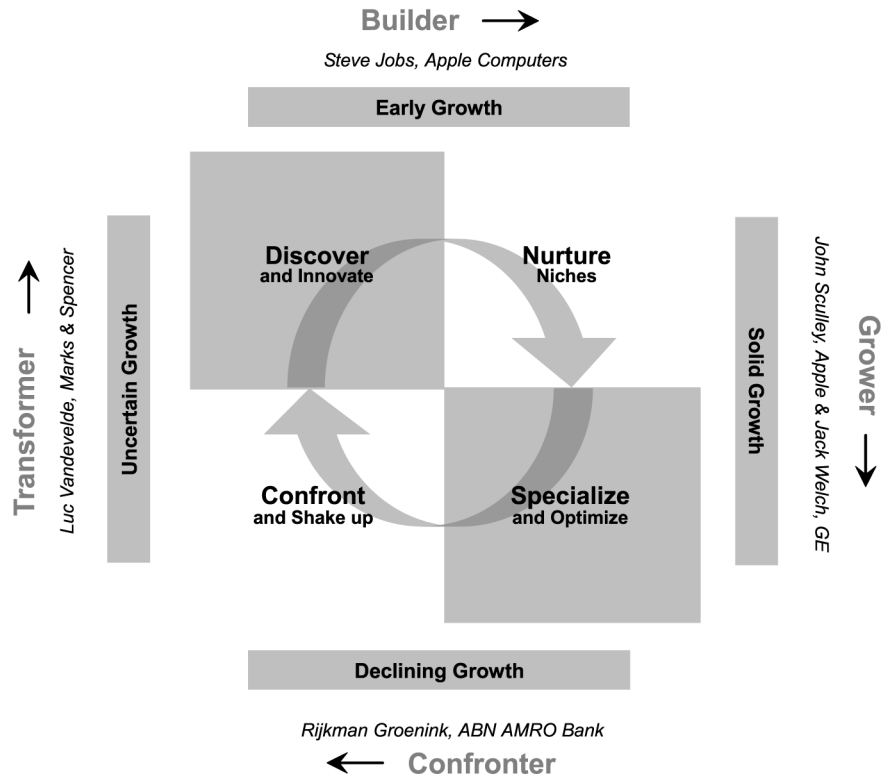


Figure 1.
Company development stages and temporal comfort zones

skin, he sets out to market it as a recipe. The story goes that he knocked on a thousand doors. But, no doors are opened by people interested in buying it. Finally, he meets someone, who is willing to use the recipe but on certain conditions only. The Colonel receives a commission for each chicken prepared his way and sold. The rest is history. The recipe leads to rapidly growing sales and, eventually, the Kentucky Fried Chicken chain. The discovery stage is characterized by a relentless search for a new concept, product or approach that has the capacity to generate sustained revenue growth.

The niche-nurturing stage

In the niche-nurturing stage (Figure 1: top-right quadrant), the role of a leader changes. The creation of an organization, which brings a new business concept or product to the market, tops the leader's list of things to do. Not only is the choice of target products important but also is the build-up of a team of motivated and hard-working people. More than ever, the leader functions as a role model to his team. Both as father and mother to his organization, he demands to be involved in nearly everything, personally pursuing matters and making the decisions. The niche-nurturing stage demands a high degree of commitment and energy from all involved. With only a vision of future success, the road to steady growth is yet in the making. Indeed, the operational framework is established while promising niches are explored. When (revenue) growth sets in, the increasing business volume is pursued with enthusiasm and longer working hours. However, at some point in time, longer working hours no longer have the desired effect. It feels like the organization has reached its limits and is running into a wall. Then, her (generally functional) structure needs considerable modification to break through its apparent ceiling of growth.

The specialization and expansion stage

In the specialization and expansion stage (Figure 1: bottom-right quadrant), the role of the leader changes yet again. Operational optimization is a central issue in this stage. Specialists are introduced that outperform generalists. However, a rigorously controlled and process-focused organization is needed to seamlessly link their activities. The tasks of each specialist as well as their contribution to the end result must be well defined and traced. Still "the boss" in a niche-nurturing stage, a leader is expected to share power with others in the specialization and expansion stage. Certain decisions are fanned out to specialists hoping to establish an increasingly better-balanced and more predictable operational flow. Not surprisingly, the organization becomes more complex in this stage as it is not always clear where decisions are made. This situation leads to the development of certain attitudes, myth forming and a more prescriptive corporate culture. In such a culture, new initiatives are fine as long as you stick to the party line and do not break any of the written or unwritten rules. When market conditions are stable, this stage can be accompanied by a long period of sustained growth. However, because considerable attention is given to the optimization of operational processes, the organization gradually starts turning into itself. A certain degree of navel-gazing develops when the company loses perspective of the outside environment as it reasons increasingly from inside the box.

The shake-up stage

The shake-up stage (Figure 1: bottom-left quadrant) is reached generally as a result of dramatic events in the market. Macro-economic developments, new competitors, improved technologies and/or products tend to have a negative and sometimes devastating effect on corporate growth. Subdued organizations that are no longer able to adapt vividly enough to a changing environment fall victim to such events. Although each individual seems to know what needs fixing, the organization, as a whole, is incapable of developing the appropriate response. The reason is that it has been designed as a well-oiled, yet rigid machine that efficiently pushes volume and not as a device that changes itself from the inside out. Another kind of leader is needed, in particular, someone who confronts the organization with its not-invented-here syndrome, its self-righteousness and prejudice. In the shake-up stage, a leader simplifies the structure and force-feeds external solutions and examples of success. In this way, the leader opens up the organization to influences from outside slowly but surely. For many in the organization, this kind of a turnaround is difficult to accept. For those who do not adapt, the way out is the only way and, often, also a relief. The objective of a confronting leader is to rationalize the organization in such a way that the overall performance is improved so that time and funds are created for a new discovery stage. The (re-) discovery stage only sets in for real if the leader creates conditions in which people with initiative get a chance (as internal entrepreneurs) to help start a new cycle of business growth.

Although many people say they function well in each stage of corporate development, it seems that leaders at every level of the organization generally identify most with one specific stage only.

Where are you?

When you read the above development stage descriptions, with which leader do you identify most?

Although many people say they function well in each stage of development, it seems that leaders at every level of the organization generally identify most with one specific stage only[3].

Temporal comfort zones

The numerous reports about the achievements of prominent business leaders confirm the existence of so-called “temporal comfort zones” or time-based comfort zones. These comfort zones unmistakably match the above-mentioned fundamental stages of corporate development. Here are a number of remarkable examples of leaders who excel particularly in one specific stage of corporate development[4].

Whereas the search for product niches energizes Jobs, the expansion and duplication of success make the world of Sculley go round.

Steve Jobs – builder

The history of Apple Computer stands out by its repeated transition towards a niche-nurturing stage. As one of the two company founders, Steve Jobs excels particularly as a “builder” who successfully develops new product niches through innovative products, such as, the Apple I, II, III, Lisa and Macintosh (although not all

successful). The approach of Steve Jobs is focused on the creation of a work environment in which whiz-kid engineers flourish. With the help of a motivated team of talented, even eccentric people, he manages to achieve annual revenues of up to 600 million dollars. Steve Jobs is eventually ousted when the business runs astray and John Sculley, whom Jobs brought into the company as a possible successor, takes over. Sculley is a different kind of leader. Bred in the stables of Pepsi Cola, Sculley focuses more on the optimization of operational and marketing processes (Sculley and Byrne, 1988). Whereas the search for product niches energizes Jobs, the expansion and duplication of success make the world of Sculley go round (Angelelli, 1994). Within a decade, Sculley manages to increase annual revenues 13 fold to 8 billions dollars. But then, as revenues start declining, Sculley runs into a wall. He fails to set off another cycle of growth and stumbles over the development of a new product niche (the hand-held Newton). After Sculley leaves the company, he is succeeded by two successors one after the other (Spindler and Amelio). Each of them cuts into the organization hoping to level costs with declining revenues but both fail to revive the company. Amelio, however, manages to convince Steve Jobs to help rebuild the company. Contrary to his predecessors, Steve Jobs comes with a clear vision of the future (Wagner, 2002). He thins out the number of research projects to a handful of novel ones. Again, he turns into a role model for his people and as a manager who demands to be involved in everything (Deutschman, 2000). Not only does he introduce the iMac, the network computer, and the I-Pod, the personal sound companion, but he also opens a chain of Apple stores. He is a remarkable example of a leader who excels in one particular stage of corporate development.

Jack Welch – grower

When, in 1981, Jack Welch is appointed to CEO, the value of General Electric (GE) is estimated to be 12 billion dollars. After 20 years of Jack Welch, the company's value increased to a whopping sum of 280 billion dollars (Byrne, 1998). Without question, Jack Welch's leadership example is that of a "grower". In the first years of his reign, he is referred to as "Neutron Jack" after he reduces GE's payroll by 100,000 as part of a strategy to "fix, sell or close" each business maintaining only those ranking first or second on the market (Welch and Byrne, 2002). From then on, Welch becomes the driving force behind the improvement of people and processes. He commits the entire company to the demanding "Six Sigma" quality program, in fact, the largest quality initiative ever mounted in Corporate America. Welch asks his managers to identify top performers as well as those in the bottom range in this way sustaining a ruthless process of selection. Those who excel get his attention. He personally engages more than 15,000 managers and executives in training sessions. Charmed by the disciplined approach of the army, he also hires hundreds of junior military officers annually. In short, Welch creates a process-focused organization that excels in duplicating success and expanding the business. Welch is also known for the number of acquisitions that he did. He buys companies with a proven track record that are also in the expansion stage and, thus, match his comfort zone.

By now, Jeffrey Immelt has taken over from Jack Welch. As in many other companies, growth is on the decline. However, selling less performing businesses, like Welch did, is not an option for Immelt (Silverman, 2002a). GE's businesses have grown so much that no company is rich enough to buy them. Therefore, Immelt has but one

option and that is to move to a confrontation stage followed by a (re-)exploration stage. The renewed interest for the research capabilities of the company (which, incidentally, Edison established) should be seen a sign on the wall (Silverman, 2002b).

Rijkman Groenink – confronter

The appointment of Rijkman Groenink as chairman of the board of management of ABN AMRO comes to many as a surprise. By outsiders, he is seen as a hardnosed executive with a sometimes less than diplomatic directness. But after more than 100 years in business, the bank needed someone who would challenge its increasingly inward orientation. The entrepreneurial spirit of its founders in the colonial past (who followed the Dutch traders across the world) had slowly been choked by the bank's progressively complex culture. A long period of relatively favorable corporate results fostered an excessive search for consensus and a burdensome hierarchy. In spite of sizeable investment programs, the bank had problems adapting to dramatic changes in the market. So, Rijkman Groenink confronted the bank with its self-righteousness. To increase the flexibility of the organization, he decided to carve it up into business units (*Persbericht*, 2001). And, with the introduction of a result-oriented reporting culture he achieved the necessary transparency. Loss-making products and activities could now be identified. Before the appointment of Groenink, the bank wanted to do everything itself. Now, it is exploring solutions outside for those matters that are considered as non-core. Encouraged by an increase in transparency, the changing attitudes triggered an active search for synergies between business units. Indeed, Groenink is a leader who confronts and shakes up hoping to create a platform for the next stage of development and maybe even the rediscovery of the banking business.

Luc Vandevelde – transformer

The Belgian CEO of Marks & Spencer, Luc Vandevelde, is responsible for rebuilding the 118-year-old British retail institution. The restructuring of the company is not limited to the layoff of 4,000 employees and the closure of money-losing stores in Continental Europe. Luc Vandevelde aims for the transformation of the entire business and raises new capital to do so. With the help of the young executives that he pulled in, he hopes to reinvent the business of Marks & Spencer. Initially specialized in apparel, Vandevelde now acknowledges that food is central to the success of the business. He also experiments with a new "convenience store format" in London that, if successful, could well be rolled out in the United Kingdom (*Eurofood*, 2001). Vandevelde is a "transformer," who takes a company from shake-up to rediscovery. Transformers encourage entrepreneurs in the organization to explore new business concepts. If need be, transformers attract entrepreneurial talent from outside.

Suffocating dominance

As the above exemplifies, successful leaders create behavioral forces based on their comfort zone. They take on the transformation of their organization until it reaches the development stage (the quadrants in Figure 1) that matches their own comfort zone. The reports on Steve Jobs, John Sculley and Jack Welch illustrate that example leaders are inclined to keep their organization within their comfort zone by reinforcing certain behavioral rules. Internal and external events (such as the retirement of Jack Welch and the subsequent worsening of market conditions) make that leaders may lose their grip on

the organization. Only then, a company gets a chance to continue its natural path of development.

Unfortunately, as the situation in many family-owned companies illustrates, the dominance of owner-managers can be such that they suffocate the natural development of their organization[5]. This can lead to the regrettable situation, where an entrepreneur first brings life to the business and then chokes it until death sets in. Of course, this cannot be the intention of these entrepreneurs and, hence, the question is why they do so.

Temporal sensitivity

The blindness of leaders (when it comes to the limits of their reign) lies in an insufficiently differentiated understanding of leadership that is “temporally” numb. Leaders today do not acknowledge enough the effects generated by the developmental dynamics of organizations themselves. As self-organizing complex systems that evolve, organizations shape the conditions for success nearly as much as leaders do.

The notion of leadership “styles” does not bring resolve as styles do not generally relate to the above-mentioned stages of development. In fact, leaders who share the same temporal comfort zone may well differ in style. Leadership style does simply not equate to temporal comfort zone.

A view of leadership, that is temporally insensitive, may lead to the dangerous conclusion that established leaders will achieve success in any stage of corporate development. Reality shows that this cannot be true. Even Steve Jobs and John Sculley lose their golden touch once they operate outside their temporal comfort zone.

The extreme sensitivity of organizations to leaders with a certain temporal comfort zone means that also those who deal with governance must become more conscious of the phenomenon. On the one hand, the selection of executive and non-executive directors should be based on their temporal comfort zone and thus on their ability to contribute to up-and-coming stages of development. On the other hand, the board should keep the company or organization at a certain distance in order to identify clearly and timely the need for transition from one stage to another. One might well refer here to the need for developmentally sensitive or temporal “helicopter qualities.”

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Finally, the increase in speed with which new products are brought to the market means that competitive advantage becomes ever more dependent on the ability to adapt to an emerging stage of development. This is another reason why it is important timely to appoint leaders with the appropriate comfort zone. Again, “timing” is of the essence.

Managing temporal issues and leadership

In one and the same company, business units are likely to and generally do differ in stage of development. At the same time, the development stage of a company as a whole may not necessarily be the same as that of its parts. Jack Welch resolved this issue by selling those businesses that did not match his comfort zone (specialization and expansion stage). Not surprisingly, some of the businesses that did not perform under the GE umbrella flourished under a different management. But, as Jeffrey

Immelt now experiences, not many leaders have that choice. They are put up with businesses that need to improve their ability to adapt.

More responsive businesses can be achieved by rotating executives depending on their comfort zone and the emerging development stages. The appointment of leaders with the right comfort zone is often sufficient to tip the balance in favor of the necessary transition.

With the following actions, one effectively starts using temporal comfort zones as change instruments.

Put the evaluation of development stages and comfort zones on the agenda of all strategic workshops

In this way, temporal comfort zones and development stages become part of the common corporate thinking and language. As a result, the acknowledgement of strategic priorities is achieved simply by agreeing on the development stage of an organization. A proactive and understanding attitude is also achieved, in particular, when participants relate their own comfort zone to the development stage of their work environment.

Make the desired temporal comfort zone part of the management selection process

As part of the executive search process, the temporal comfort zone of candidates should be identified and verified. At the same time, career-development planning should take into account the necessary cross-comfort-zone experience of leaders at the various levels of an organization.

Leadership is not a trait with universal application and that might be contrary to what the current leadership ethos might suggest. Indeed, leadership includes certain specializations. These are not necessarily specializations related to the physical environment but to the time environment of an organization. In other words, a leader may well function across various sectors and industries, but, in the end, his or her success depends on whether the leader's comfort zone agrees with the up-and-coming development stage of the organization.

Towards a holistically learning organization

During the second Gulf war, the young brigadier general, Brown, repeatedly mentioned that the US Army works as a learning organization. As the Army proved in that action, it is capable of successfully adapting its maneuvers to changing circumstances.

How might development stages and temporal comfort zones contribute to the learning capacity of an organization? To answer this question, it is useful to explain the typical organizational learning processes first.

Single-loop learning

The learning organization has originally been introduced by Chris Argyris and Donald Schön[6]. They defined two types of learning processes. The simplest form of organizational learning is single-loop learning. Single-loop learning refers to a process in which a company or an organization adjusts its actions to achieve previously defined goals.

Argyris and Schön refer to the working of a thermostat. When the room temperature drops below the target temperature, the thermostat switches on the heating equipment. The thermostat effectively measures the difference between the target temperature and

the room temperature and undertakes action when they differ. So, if after a while the target temperature is reached, the thermostat undertakes action again by switching off the heater.

Double-loop learning

But, what happens if the temperature outside is so low that the heating equipment is not able to bring the room temperature to the target level? At that moment, the thermostat is powerless. Hence, Argyris and Schön suggest a second level of learning referring to it as double-loop learning.

In a double-loop learning process, the situation is judged on a broader base. One may decide to lower the target temperature but one may also decide to increase the capacity of the heating equipment. That decision depends on an evaluation of the climatic situation (the external environment). Are we dealing with long-term climatic change or is it just a temporary phenomenon? On the other hand, the capacity of the heating equipment may have deteriorated (the internal environment)?

The double-loop learning process in an organization does not work very much different. If business targets are not realized with the necessary actions then this will lead to an evaluation of the external and internal environment. Again, the question is whether the organization is dealing with a temporary situation or a permanent trend. Based on the conclusions, new targets may be set. This is often followed by a tiresome process in which existing strategies and norms are adjusted or replaced. Not surprisingly, tensions are produced when established opinions, ideas and roles must make room for new ones.

At a higher level of learning, an organization develops a broader view on her functioning and increases her awareness of the actions it undertakes in relation to the market environment. Figure 3 shows the two levels of learning as steps two and three.

Deutero learning

The source of inspiration for Argyris and Schön was the renowned anthropologist, Gregory Bateson, who introduced cybernetics to the social sciences. Next to the two levels of learning, Bateson (1972) introduced the deutero-learning effect.

He discovered that people increase their speed of learning through repetition. In other words, the habit of learning results in steeper learning curves.

Through repetition, organizations may also increase the speed of single-loop and double-loop learning. This in itself is a reason regularly to confront an organization with its performance and functioning by means of a planning process.

However, deutero learning does not increase the level of awareness because it does not require a broader view of the organization's functioning. According to Bateson, it is more the positive force of habit that increases the speed of learning.

The habits that evolve during a certain development stage first help an organization achieve results more efficiently. But, at some point in time, habit will no longer be experienced as a positive force but as the force that limits the organization in her actions especially when moving from one stage to another.

Triple-loop learning (van der Erve, 2003)

The identification and explanation of development-stage transitions and temporal comfort zones yields an additional level of organizational awareness. Essentially, this

awareness concerns the time environment and hints how the organization should respond as it continues to develop. I suggest referring to this as triple-loop learning.

The definition of stages of company development and temporal comfort zones brings the internal dimension of change to the surface. This dimension reflects the outcome of interactions within an organization as a complex and not completely predictable being.

In each stage of development, an organization resembles a distinct being that shares the same culture but differs in the way it interprets its environment.

During a stage of development while being managed by a leader with a particular comfort zone, an organization behaves as a being with a specific personality. In other words, in each stage of development, an organization resembles a distinct being that shares the same culture but differs in the way it interprets its (market and corporate) environment.

The double-loop learning process indeed embraces change processes as a result of internal and external influences. But, it fails to recognize clearly the fundamental differences between the perceptions of organizations that traverse differing development stages. The definition of development stages and temporal comfort zones provides a new dimension of corporate awareness which enables triple-loop learning. This dimension concerns the time dimension or time environment of an organization. When it comes to consciousness in general, longitudinal or time-related aspects indeed determine our awareness of the here and now[7].

Within the confines of one stage of development, double-loop learning takes place when an organization responds to changes in the internal or external environment. But in time-environment transitions (when organizations change from one stage to another), triple-loop learning is the name of the game. Of course as change actually unfolds, triple-loop learning embraces elements of the double-loop learning process particularly when an organization reads the market and, then, formulates a strategic response (Figure 3). But when an organization does so, the “personality” with which it reads the environment is identified through the triple-loop learning process.

Mini-case: connecting through another dimension. The pressure in the IT organization of a large and widespread semi-government group in the Netherlands mounted. The established platform of projects had been rocked by the board’s decision to turn the company into an e-business concern. New insights and priorities followed in rapid succession. By nature focused on providing a stable and secure systems environment, the IT management team now faced an increasingly volatile situation. Their internal clients struggled with new priorities that were triggered by the up-and-coming wave of change and so did they. The department’s organizational architecture had turned into an insensitive grid as department heads gradually retreated to formal positions (hoping the upheaval would blow over soon). The opposite happened. The atmosphere heated up as gaps deepened. As prisoners of their organizational structure, how could they develop a common perspective again? What could they do to improve their responsiveness to change? How could they make the others (their internal clients) better understand their situation? Several initiatives failed. By chance, we got in touch with the IT manager. Our proposal was to help the organization find another dimension through which it could connect. We suggested using the dimension of “time”. In a one-day workshop, we introduced the team to the

notion that departments, organizations, projects and companies, as wholes, can be interpreted not only based on their niche or role but also on their stage of development (time environment). In other words, similarities can be identified when departments (however different) are traversing the same time environment (or stage of development). In addition, by identifying their temporal comfort zone, managers learned about their predominant views and those of their colleagues. They also learned about any misfits between the development stage of a department and the temporal comfort zone of its leader. A new (time-based) world of understanding emerged and so did an arsenal of possibilities to connect. The diagrams in Figures 1 and 2 evolved to become key tools when trying to make sense of their world of change.

Conclusion

Through the identification of development stages and temporal comfort zones, we have obtained an instrument that allows management boards to keep a finger on the pulse of organizations and their leaders. This instrument helps in the selection of leaders and, thus, the desired behavioral traits. As a mapping device, it helps trace the development path of a company or organization. Being able to identify dogmatic behavior at the end of a development stage, supervisory boards as well as management boards can now pursue timely the necessary transition by attracting leaders with the appropriate comfort zone. However, at every level of the organization, leaders are at work. Whether they are specialist or departmental head, each leader may either advance their organization to the next stage of development or confine the behavior their people within the narrowly boundaries of their own temporal comfort zone. Hence, as illustrated in Figure 3,

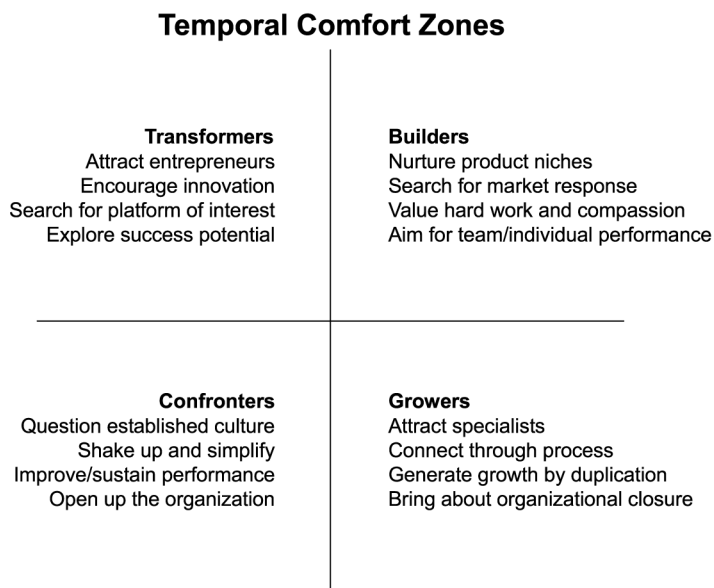


Figure 2.
What leaders focus on most depends on their temporal comfort zone

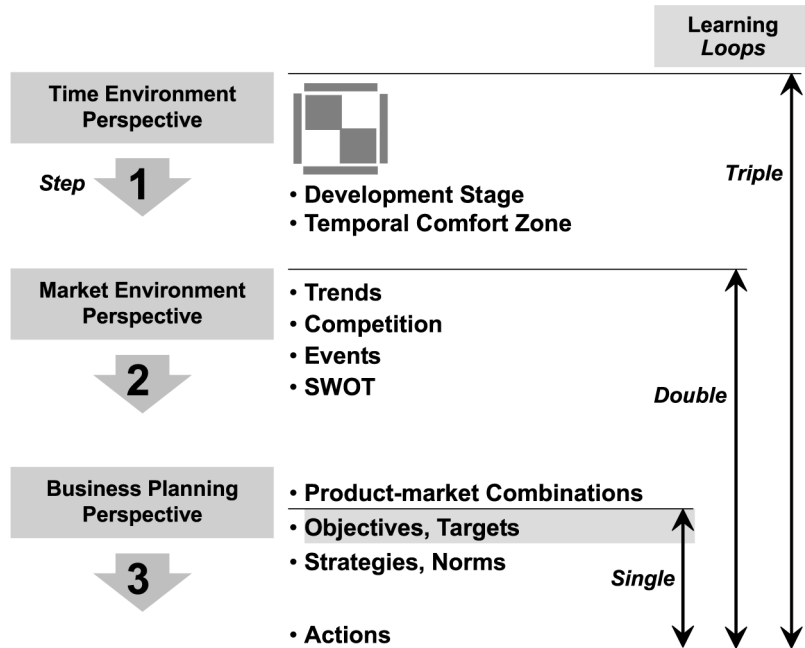


Figure 3.
Triple-loop learning as
integral part of the
management process

the evaluation of development stages and temporal comfort zones must become an essential part of the management process.

Notes

1. van der Erve (1994) explores the theoretical background of these stages. In van der Erve (1998), the background of these stages is discussed based on the findings of a European management survey.
2. The renowned economist and Nobel laureate Hayek (1988) refers to the selection of behavioral rules.
3. The various stage-related orientations were verified as part of the selection process of top-management candidates. The verification was based on the consistency between the candidate's choice of temporal comfort zone and his career development pattern. Also, more than 100 participants evaluated their comfort zone during various strategy-implementation workshops.
4. As first identified in van der Erve (2003).
5. Personally, I witnessed how formidable entrepreneurs handed over their company to a successor with the right temporal comfort zone. Unfortunately, I also met equally formidable entrepreneurs, who nearly ruined their company because they refused to do so.
6. The terms single-loop learning and double-loop learning are exhaustively explained by Argyris and Schön (1978).
7. One of the most important thinkers on consciousness is the recently deceased biologist and neuroscientist, Francisco Varela. In *The View From Within*, in the chapter on "Present-time Consciousness", Varela (1999) describes the longitudinal nature of our consciousness.

Images traverse our brain in roughly two stages: pre-reflection (a sense of what is coming ahead), followed by retentional flow (the sense of things drifting away). The Japanese physicist, Ichiro Tsuda, effectively confirms Varela's observation. In his book, *Complex Systems: Chaos and Beyond*, Tsuda (2000) provides a mathematical framework for memory processes and introduces the notion of chaos itinerancy. Time (not space) is the most important dimension in which our (sense of) reality unfolds as a complex wave-like signal.

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