

# Crossing Borders: Globalization and Its Impact on Corporate Cultures Working Across Cultures: A Complex Adaptive Systems Perspective Glenda H. Eoyang

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## *Introduction*

"Cultural systems are coherent patterns of understanding built from the reciprocal relationships among

- 1) **knowledge or beliefs:** the shared conceptual understandings of what or how things are;
- 2) **patterns of practice:** both the models for doing and the model-guided, habituated actions of everyday practice;
- 3) **3 tools and artifacts:** the means and ends of practical action; and
- 4) **patterns of affect** which embody the compelling force of culturally appropriate models. The relationship between ideology and practice is especially crucial to understanding assent and then involvement . . . . Culture is never just an intellectual or cognitive category, but rather one that is intimately tied to how people do things--praxis, and what they do them with--tools and technologies. Cultural patterns are both models of reality and also models for acting in the world (Geertz, 1973). A monastic rule for prayer and fasting and a company's manual of Standard Operating Procedures (SOPs) are similarly guides to right (if not always righteous) conduct. Conversely, the daily process of acting according to the guides makes the world envisioned in those guides both believable and compelling. The continuous reiteration of everyday practice habituates us to the coherence and validity of this reality (Dubinkas, 1994, p. 109)."

In this passage, Frank Dubinkas described the complex, interactive nature of culture in an organization. He sounded some of his favorite themes: reciprocity of relationships, interdependence of thought and action, the individual's and the corporation's need for coherence. These perspectives are even more critical to success in our times of rapid and uncontrolled change, of increasing global interdependence, of exploding technological capacity, and of economic uncertainty for individuals and institutions. Much of Frank's work revolved around these issues.

Today I would like to revisit and extend his work by looking at these issues through the lens of complex, adaptive systems. Many threads of complexity science throw light on the subject of corporate culture and cross-cultural interactions. Frank investigated many metaphors from chaos and complexity and their applications to the behavior of organizations. He wrote and talked about concepts such as sensitive dependence on initial conditions, strange attractors, self-similarity, and self-organization (Dubinkas, 1994). In his application of these ideas, he sought to describe the often surprising dynamics of human behavior and institutional change.

Since Frank's work was completed, the sciences of complexity have continued to emerge on a variety of fronts, including the biological and environmental sciences (Gell-Mann, 1994; Kauffman, 1995; and Guastello, 1995). Today I would like to focus specifically on the concept of fitness and fitness landscapes as they apply to the evolution of survival strategies for individuals and organizations. I will describe issues that have been addressed regarding the challenges of cross-cultural corporate interaction, introduce and define the concept of fitness as it is addressed in the complexity literature, and use the concept of fitness to describe the cross-cultural issues that Frank uncovered in his work with the Apple Erickson project.

## ***Cross-Cultural Corporate Conflict***

As we have heard today, many disciplines and groups are concerned about communication, business relationships, and development across cultural boundaries. These issues have been addressed in terms of ethical conflict and alternative strategies (Kohls & Buller, 1994), organizational commitment and values (Randall, 1993), and problem solving approaches and cognitive styles (Abramson, 1992). In all of these contexts, it is clear that differences do exist among cultures, and that those differences can have a deleterious effect on personal and business interactions across cultural boundaries. What is a perfectly effective and widely-accepted behavior in one culture may be counter-intuitive, at best, and tabu, at worst, in another environment. Strategies for dealing with cultural dissonance vary along " . . . a continuum from complete adaptation to the host culture's ethical standards to complete insistence on the application of home country standards" (Kohls & Buller, 1994). The decision to adopt one or another behavior along the continuum depends on a number of factors related to the immediate issue, circumstances, experience of the participant, and power distribution among the persons involved. Many research efforts seek to analyze the differences between cultures and to develop strategies that allow an individual to function effectively across those boundaries. Any number of analytical models might be used to cluster and label some of the dimensions of difference between cultures. Theoretically, these models may be internally consistent and appear to be complete. In practice, however, they are insufficient to capture the multi-dimensional, highly dynamic complexity of cross-cultural interactions.

When managers or technicians make decisions or take action across the cultural divide, they seldom depend on the clear-cut models of interaction learned in a class on cross-cultural communication. Rather, they respond to immediate stimuli and recent experience in the context of their long-held beliefs about what works. They make decisions that, they believe, will lead to survival of their professional roles, their projects, or their institutions. Having acted on this foundation, they observe the response, adapt, and generate their next actions to perpetuate survival. Such a dynamic perspective on cross-cultural communication provides an opportunity to meld theory and practice--the theory is based in process (fitness), and the practice is locally determined to meet the immediate needs of the individuals and the environmental circumstances.

## ***Fitness Landscapes***

In *At Home in the Universe*, Stuart Kauffman describes the concept of the fitness landscape. Drawn from biological sciences of evolution and adaptation and reconstructed for investigation in computer simulations, the fitness landscape seeks to model the process of self-organization and natural selection that results in "survival of the fittest."

"Adaptation is usually thought of as a process of "hill climbing" through minor variations toward "peaks" of high fitness on a fitness landscape. And natural selection is thought of as "pulling" an adaptive population toward such peaks. We can imagine a mountain range on which populations of organisms (or in this case, programs [individuals or project teams]) are feeling their way to the summits. Depending on whether it is beneficial, a random change in the genome (the computer code [communications strategy]) puts a mutant higher or lower on the terrain. If the mountain terrain is rugged, but looks like familiar mountains, the terrain is still smooth enough to provide clues to the immediate vicinity about which direction to take. There are pathways uphill to the distant peaks, and natural selection, in sifting for the fitter variants, pulls the population to toward them" (Kauffman, 1994, p. 154).

How can this metaphor help us understand the process of cross-cultural interaction and communication? Consider a culture in which the behavior of eye-to-eye contact is beneficial. Persons who accidentally practice this behavior are rewarded. They fare well, survive, reproduce (or move up the corporate ladder) faster than persons who have not perfected this variant of behavior. Effective eye contact is a peak on the fitness landscape. Individuals who recognize this landscape but have not

yet reached the peak are able to collect the clues, adapt their behaviors, make eye contact, and move uphill toward greater fitness. Those who do not know the "landscape," may be unable to discern which of a variety of behaviors will move them uphill on the terrain. They may randomly try many variant behaviors--louder speech, flashier dress, spontaneous sports chat--in their efforts to find the fitness peak and move up it toward greater fitness.

This is the kind of process one would expect if the fitness landscape were constant and individuals moved around on it, looking for behaviors that would scale the peaks. In reality, however, the situation is not that simple. Peaks on the fitness landscape are not immutable nor absolute. Rather, they are determined by complex interdependencies among the individuals participating in the climb. The peaks are "negotiated" in the fitness landscape based on a combination of forces including system history, interdependency among behaviors and individuals who exhibit those behaviors, and factors external to the system, like availability of resources or access to information. These complex interactions result in peaks that are not arbitrary or global, they are entirely context dependent and locally determined.

But that is not the only complication. The landscape is dynamic. Peaks appear and disappear based on a variety of factors. For example, as a large number of individuals climb to one peak, it may lose its fitness value. In fact, the same behavior that increased fitness previously may become a valley on the fitness landscape in the future. Consider corporate dress as a mutant gene. At one time, the three-piece suit and vest were the fitness peak for corporate America. A variety of forces shifted the landscape for Fridays, only. On Fridays, the peak of dress fitness was neatly pressed quasi-casual clothes. Only a visit from a very important customer (another fitness landscape altogether) would cause one to be caught in a three-piece suit on Friday.

The customer visit on Friday introduces a final, and most telling, complication to the concept of the fitness landscape. Though fitness landscapes are usually determined by local variables, two different fitness landscapes may be coupled together. In coupled landscapes, fitness peaks and valleys in one are influenced by fitness peaks and valleys in the other. We see this when the visiting customer made formal dress a survival mutation even on Friday. Our culture may define one fitness landscape for internal corporate interactions and a different landscape for client interactions. The two definitions of fitness, however, are not totally independent. They are coupled, so that successful interactions with customers may contribute to the definition of successful interactions with co-workers and visa versa. The coupling of landscapes provides a dynamic environment in which survival decisions change over time. Familiar landscapes may be distorted beyond recognition when they are suddenly coupled to landscapes of extremely different terrain.

That, I believe, is what happens in cross-cultural communication. Each of us comes to know a fitness landscape intimately. When a new peak appears or an old one disappears, we may or may not be sensitive to the change or willing to adapt our strategies. When we interact with others, whose familiar landscapes are different from our own, the two landscapes couple. Each one distorts the other. We go through a period of time in which peaks and valleys are established and new strategies are developed by a process of trial and error. In cross-cultural communication, this problem is compounded because of the extreme differences in the native landscapes.

Many ways exist to talk about corporate or national cultures. Why is a new one required? What benefits are provided by talking about cultural difference through this particular model of cultural formation? I believe there are many benefits to the use of the fitness landscape as a model of cultural interaction. A fitness landscape, behavior of individuals, emergent strategies, and coupling of landscapes can be simulated on the computer effectively. We can experiment with a variety of adaptation strategies and implications in an environment that is bounded and representative of our real world. The model provides a compelling visual image of the challenges involved in cultural adaptation. We have all climbed hills to their peaks and slid down valleys to their lowest points. We know what those experiences feel like. The landscape model uses this physical memory and visual image to help us understand the frustrations and elations of negotiating fitness in a cultural environment. Because the topology of the landscape is integrated (though not continuous), every step has meaning in the context

of the whole. By taking a small step, one can determine which directions are likely to lead "up" or "down." One can make individual choices without knowing whether or not we are moving toward the highest peak. This allows us, as Frank pointed out, to make practical steps without having a theoretical view of the global environment. This is, in fact, what we must do as we negotiate cultural differences in real life. Whether the landscape is relatively smooth or rough, one can take small steps toward adaptation. When the small step leads the wrong way, one can turn around and try another path. This provides an evolutionary path toward cultural consonance. Such a view seems more representative of real world experience than the expectation of an all-or-nothing game, where any misstep is potentially disastrous. Interactions among participants and coupling of various landscapes demonstrate the dynamic nature of cultures and adaptation within those cultures. With most cultural models, our language implies that the culture is static, and only our strategies are dynamic. In the landscape model, we are constantly aware that our adaptive strategies can and frequently do cause the culture itself to evolve.

For all of these reasons, it seems that the fitness landscape model of culture might be a potentially fruitful way to describe culture and cross-cultural adaptation. In the rest of this paper, I will use this concept of cultural fitness landscapes to analyze Frank's data about cross-cultural communication in the Apple Erickson case study. I believe that this approach sheds light on the issues and concerns he documented during his time at Apple.

### ***Erickson: A Study of Landscapes***

Frank lived and worked with a project team from Apple as they designed, developed, implemented, and later scrapped a mega-machine that managed the construction and testing of Macintosh computers. Between January and October 1990, the entire system was specified, designed, tested, implemented, and put into operation. Frank's notes, papers, and descriptions of the project cover a wide range of issues from project planning and management to human factors considerations in systems design and implementation. In this talk, I will focus only on the issues he identified that related to cross-cultural communications and their impact on the product and process of the project. The Erickson project required cooperation and integration of three different groups and their fitness landscapes: the Apple team of specialists in mechanical engineering, controls, facilities management, and other disciplines related to the project; the Japanese team from Hirata (the vendor selected to design and manufacture the machine according to specifications provided by the Apple team); and the Apple Computers, Inc. corporate culture. We will look at the definitions of fitness in each of these groups and two specific cases of coupling that emerged in the course of the project.

### ***The Apple Team***

Fitness, as defined by the Apple team, evolved from the members' various expectations of fitness and from their complex interactions on the team. The Apple team included persons from a wide range of national, racial, and cultural backgrounds. It included both males and females. Though in some contexts these differences would have been difficult to overcome, fitness landscapes based on such different personal and social experiences seemed not to influence the work of the team greatly. They quickly coupled their individual landscapes into the one that focused a definition of fitness on the features and functions of their common product.

There was, however, one area in which the coupling of the team members' landscapes was not so seamless. The team was composed of engineering specialists of various disciplines. Each one brought to the team a unique definition of fitness, based on his or her education and practical experience. For the controls expert, optimal design of the control systems was of utmost importance. For the mechanical engineer, the stability and maintainability of the physical structure constituted the primary fitness peak. Each member of the team contributed a different definition of technical fitness to their specifications of the product. One of the themes that appears frequently in Frank's notes is the struggles that arose when optimization of one of the subsystems resulted in sub-optimization of

another. These conversations document the process of coupling the various fitness landscapes of distinct disciplines as the specification and design stages of the project progressed. Many conflicts were left unresolved in the specification document, and they were only resolved when schedule and budget constraints (other peaks on the team's fitness landscape) limited the options for technical perfection and made the local technical fitness peaks insignificant.

Several fitness peaks were shared by the Apple team as a whole. These issues became the focal point of work throughout much of the project. Those included:

Internal consistency and independence of the completed product. The Apple team worked to build an elegant, mechanized process to control for every variation that might arise in the production process. In spite of suggestions that they allow line workers to trouble-shoot unexpected variations, the team continued to push for total automation. Pre-specification of all features and functions. The team's expectation was that the spec document would define completely the fitness of the product. They expressed a great deal of discomfort when it became clear, six weeks into the project, that Hirata was working from a bad translation of a draft specification. Like many technical experts, the team defined the spec document as the definition of the fitness landscape for the product to be created. It was only late in the project that other definitions of fitness (on-time, under-budget, simplicity of design, and ease of use) impinged on the role of the specs as concrete definitions of fitness. The team went through great difficulty when they were forced to admit that the specifications were faulty, incomplete, or too complicated. Project schedule and budget. These administrative definitions of fitness were critical to the teams' work and their perceptions of success. Though imposed by forces outside of the team's immediate context, these factors drove many of the decisions that were made about the project process and the product design and implementation.

The Apple team was working on a landscape that included the coupling of their individual technical criteria for success, their expectations of internal consistency and pre-specification, and their corporate requirements of project schedule and budget. These factors built the landscape across which the team moved during the early phases of the project. These were the parameters against which they measured success for themselves and their project.

In Kauffman's terms, the conflicting technical constraints of the project construct a rugged landscape, which includes many local maxima. The problem is that the traveler may climb a local peak (to optimize one aspect of fitness) and get stuck there--unable to see other, higher or more fit peaks in the distance. Throughout the project, Frank documents circumstances in which this happens. One group finds one solution; the other group finds another solution. Early in the project, such conflicts were resolved in battles of wills--the group with the loudest voice or longest arguments won the day. Later in the project, however, the landscape became less rugged. The schedule and budget became the most dominant peaks in the fitness landscape. The local peaks became less attractive, and team members sacrificed some local peaks to climb together up the administrative fitness peaks and meet their project objectives.

### ***The Hirata Team***

Fitness began with a very different definition for the Hirata team. Less information is available about the individual members of the Hirata team, so we cannot speculate about how their internal fitness landscape was negotiated. Based on Frank's data, however, there is information about what the Hirata team saw as fitness and how they moved, as a team toward those peaks.

Context was an important component in Hirata's definition of fitness. The Hirata team saw fitness of the product as related in some way with their organization as a whole, not just with the project team. They stipulated that the whole machine would be constructed and tested at their plant in Japan. After testing and debugging were complete, the machine would be disassembled, moved to California, and reassembled for final testing. The Apple team saw this as an unnecessary and time-consuming process. They agreed only after Hirata insisted that the testing (for fitness) would be much more reliable and efficient if it were done on their turf in Japan. The Hirata team saw the product, the project team,

and the rest of Hirata as coupled into a single unit that would function most effectively when they were together physically.

The Hirata team focused on simplicity and ease of use as a critical measure of success. Repeatedly the Japanese team discussed the human "components" of the system. They were concerned about the physical and visual requirements for persons on the assembly line. They were quite comfortable leaving some complicated functions unautomated, expecting that line workers would be more flexible and creative trouble-shooters and problem solvers than any mechanized component. In this way, it became clear that the Hirata team looked for the fittest joint performance between person and mechanism, rather than relying on the mechanism alone to reach the required fitness levels.

In many other ways, the Japanese team used wide contexts to define and to move toward fitness in the design, manufacturing, and implementation processes. At critical points throughout the project they were able to transcend an immediate problem by looking at the global landscape of the larger system. The Hirata team, like the Apple team, was working on a rough fitness landscape. They, too, had to resolve issues of technical complexity in which optimizing one component might sub-optimize another. Rather than opting for a single-peak system (schedule for the Apple team), the Japanese followed a different strategy. Kauffman describes this strategy as a way to evolve past local fitness peaks on a rough landscape. Different fitness peaks are coupled, so that motion up one deforms another. Communication (coupling) between peaks allows individuals on different local peaks to adapt to the whole by responding to the dynamic nature of their own fitness peak. The Japanese team sought to follow this strategy by replacing technical perfection of parts of the system with the overall performance of the whole.

### ***Apple Computers, Inc.***

As a corporation, Apple Computers, Inc., has a fairly simple fitness landscape. Survival of the corporation involves winning in the competition with others corporations. This survival is measured in terms of low cost, time to market, and market share. The Erickson project was seen as a step up this fitness peak when it was initiated in late 1989. The Macintosh IIci, which it was to manufacture, represented a clear move into a fitness niche identified by Apple marketing and business experts. Over the course of the project, however, several incidents deformed that landscape. A major earthquake in the Bay Area, a change in corporate management, and strategic and tactical moves by competitors shifted the peaks on the fitness landscape from December, 1989 to October, 1990. This changing corporate landscape remained uncoupled from the Erickson project, until the product was installed. The team was able to function through project completion as if the corporate landscape were frozen. It was only after full implementation that the changing corporate landscape was felt by the Erickson team.

### ***Coupling between Teams from Apple and Hirata***

The coupling relations between the Apple and Hirata teams changed drastically over the course of the project. Initially, coupling of the landscapes was expected to be severely limited. The specifications document would provide the definitions of technical fitness and provide the product couple between the two teams. The Hirata U.S. manager, located in Atlanta, would provide the information and communication link between the two. Messages would be transmitted to Atlanta, translated, and sent to the Hirata team in Japan. Any return message had to pass through the same tortuous process. Issues with poor translations of conversations and documents, problems with voice mail and e-mail communications, as well as reluctance on the part of Hirata to exchange information electronically also contributed to the lack of coordination or coupling between the Apple and Hirata teams in the early stages of the project.

The Apple team acknowledged this disconnection. Based on e-mails and memos from early phases of the project, the Apple team expected to remain safely separated from the Hirata team. Some early

concern was expressed about the constrained communications links between the two. In response to this concern, Apple management explained that communications would not be a problem because the two teams would be expected to work independently.

In March, three months into the nine-month project, the teams met together. This meeting marks the beginning of a definition of fitness for the project as a whole. Each group brought their issues and concerns about the requirements and design. Together, the group jointly determined ". . . social and technical means of coordination . . ." between the teams. Franks' notes describe: ". . . there was a lot of 'unexpected' energy around the meeting. Not exactly "surprises," but he described the event as being like a steeplechase: "the rider knows he's coming up to a barrier and knows he's going to leap and knows he can . . . but there's still a charge of energy/excitement involved in going over! Erickson may have nicked the bar a little bit, but they got over!" (F. Dubinskas, update comments, March 5, 1990).

This process of variation (through self-organization) and selection (against a fitness landscape) is the process through which distinct fitness landscapes couple. The surprising thing about the meeting was that the energy was "unexpected."

Besides face-to-face meetings in the U.S. and in Japan, the team established coordinated efforts by focusing on specific technical issues. A problem would be identified, the Apple team would propose a solution that met their criteria for excellence (automated, fail-safe, engineering elegance). The Hirata team would propose a solution based on their ideas of fitness (context dependence, flexibility, and system-wide optimization). The two solutions would be discussed in the context of schedule and budget, and a workable solution would be determined.

Through this process of repeated engagement, the fitness landscapes of the two teams became coupled, and, in most instances, the emergent landscape was better optimized for both part and whole than either of the original expectations. This adaptive process resulted in the Erickson project being successfully installed within schedule and budget with minimal engineering changes after implementation. From these perspectives, within the coupled landscapes of the two teams, the project was a complete and utter success. Unfortunately, other fitness landscapes were included in the project's universe.

### ***Coupling between the Project and Apple Computers, Inc.***

From the beginning, it was clear that the Erickson project faced an enormous task in an outrageously short time frame. To allow the team to meet these demanding expectations, the project was isolated in many ways from the rest of the organization. Team members sat close together, they were relieved of other responsibilities, relationships with interdependent groups were formalized and kept to a minimum. In many ways, the team's fitness landscape was consciously uncoupled from others at Apple Computers, Inc. This isolation was, in some ways, critical to the successful completion of the project. This same isolation, however, meant the ultimate death of the Erickson product.

The project fitness landscape developed over the project life as those of the Apple and Hirata teams co-evolved. At the same time, however, the Apple Computer landscape was evolving based on a variety of external and internal stresses on the system. The result was that the Apple team became uncoupled from their corporate fitness landscape. They were very successful with regard to their internal definitions of fitness (schedule, budget, technical excellence) and those of the corporation (flexibility, stability, cost-effectiveness).

Soon after the machine was installed, however, the Erickson fitness landscape was coupled with the corporate one. The project fitness came in direct contact with the transformed landscape of the corporation, and Apple decided to close down the Fremont plant and move all manufacturing activities to other sites. The landscape of the project disappeared and the product was measured on a landscape of quite a different type.

Closing the line was a drastic step from the point of view of the Erickson team. The team had climbed successfully to their local fitness peak. Why should they be made obsolete? From the perspective of the corporation, however, fitness in the market and the world of financial controls overrode the fitness landscape evolved in the course of the Erickson project. From this new, larger perspective, the extinction of Erickson was a logical and necessary case of natural selection that would contribute to Apple's march toward corporate survival.

## **Conclusion**

**"We are all hustling our wares--bacteria to CEO. Moreover, we are all creating niches for one another. I suspect that there is more than an analogy. I suspect that biological co-evolution and technological co-evolution, the increasing diversity of the biosphere and our "technosphere" may be governed by the same or similar fundamental laws" (Kauffman, 1995, page 217).**

Survival depends on fitness of a part in the context of the whole. Fitness can be modeled as a complicated landscape of peaks and valleys along which parts travel in their search for the fittest strategy. This landscape and the part's position on the landscape determine choices and outcomes in both local and global spheres: individual technician to project team, project team to project team, project to corporation. When isolated, each sphere can constrict the dynamic change of the local fitness landscape. When coupled, the landscapes deform in a dance of adaptation until the new, consolidated landscape of fitness emerges. When isolated, this new landscape can be fairly stable, but any new open border will move the system, again, into a dynamic play of shifting sands, where fitness is redefined and survival strategies must be rediscovered.

This paper has looked at the Erickson case through Kauffman's view of fitness landscapes and their roles in population evolution. This conceptual, case study approach to the issue indicates that the model might shed new light on the dynamics of cross-cultural communications and business relationships. This approach should be tested in additional cases and computer models designed to simulate real case dynamics. Such a process will help us confirm or deny Kauffman's suspicions that we are talking here about more than an analogy.

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