Complexity and Organizational Structure:
Internet and Visa International as Prototypes
for the Corporation of the Future

by

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Abstract

This thesis examines successful, innovative forms of corporate structure in order to identify key characteristics and requirements of these new forms of organizations. Once these have been identified, they may be useful in creating new or modifying existing corporate or organizational structures in order to deal with the accelerating pace of change. I have chosen to concentrate my analysis on two "innovative" organizations that have each existed for over twenty-five years, growing to unbelievable size and quietly changing the world as they did so.

The Internet

It is impossible to open a journal these days without being confronted with an article about the use and growth of the Internet. While it is true that the Internet is not a corporation, it nonetheless has an organizational structure that provides for coordination and decision making without central authority. The structure by which this interconnected network manages coordination between its distributed parts can provide valuable insights about how to structure a decentralized corporation or organization.

Visa International

Visa International is a corporation that is wholly owned by the member institutions that issue credit cards under its name. It was purposely architected to distribute power, authority and control to the peripheral components of its structure; it was also intentionally structured to evolve and adapt as its environment changed locally or globally. I will examine the seemingly unique characteristics of Visa's industry that generated its structure, and then identify how Visa was structured to respond to these demands.

In order to perform this analysis, I am using the concepts and tools developed as part of the Process Handbook Project directed by my thesis advisor, Thomas W. Malone, Patrick J. McGovern Professor of Information Systems, at the Center for Coordination Science at the MIT Sloan School of Management. I also apply some of the concepts of complexity theory and Karl Weick's theories on the psychology of organizing.

I extrapolate general characteristics of these centralized organizations to describe the generic case of a decentralized organization, and conclude by suggesting how decentralized organizations can best be designed. I also propose that there are numerous organizational successes and failures that can be analyzed and understood via these same characteristics and requirements. This thesis concentrates on the high level corporate structure of the Internet and Visa International rather than analysis of internal procedures.
I would like to acknowledge Professor Thomas Malone for introducing me and the other students on this structured thesis project to many ideas of what life might be like in the twenty-first century—both in terms of our professional and personal lives. I must also thank him for the opportunity to work not only with the structured thesis project at the Center for Coordination Science, but on this part of the project in particular. This research has profoundly impacted the way I look at the world, and together with my interaction with Professor Malone and the rest of the people at the Center for Coordination Science, the research has been the source of my most satisfying academic experiences during my Master's education at the MIT Sloan School.

I would also like to thank Charles Osborn, a research scientist at the Center for Coordination Science, for spending many hours with me to help understand all the fascinating data that I had collected for the project, and for knowing all the relevant organizational theory!

I also must acknowledge Mitch Kapor and the subject (MAS 962: The Political Economy of the Digital Infrastructure) he taught in the Spring of 1995 for helping me shape many of the ideas in this thesis. His insight into the Internet and its unique context has been important in the formation of many of my ideas, and I am grateful to have had the exposure to his vast knowledge.

This project would not have been half as much fun or as interesting if I had not had the opportunity to collaborate with Tor Jacob Ramsøy, a Sloan Master's student in the Management of Technology program and also a participant in the structured thesis project. His infectious enthusiasm and knowledge of the Internet made this project much more valuable both as research and as a learning experience. Similarly, the other students that participated in the project contributed significantly to its value. In many cases, they helped me understand aspects of my own research in class discussions, and I have cited them where appropriate.

Finally, I must thank all the people I interviewed, but no one more so than Dee W. Hock, the first CEO of the National BankAmericard (later Visa International), for his generous time and his willingness to share his incredible insight with me. While the ideas in this thesis (many of them his) may seem novel to some, he has been aware of them for some time; moreover, he explicitly implemented them over twenty-five years ago. It is my hope that I have done a respectable job of capturing his genius here. I look forward to his forthcoming book on this subject.
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CHAPTER ONE
INTRODUCTION

If one believes the reports in the media, the first world is currently enduring the confusing transition from the Industrial Age to the Information Age. Everywhere you look, business journals talk about the pace of change and information overload, and their effects on the current business environment. Management consulting companies are riding the wave of change to unprecedented success as corporations struggle to re-engineer processes. These corporations seek flexibility and adaptability in order to manage the continually changing requirements in the world of producing and delivering products and services. In particular, these efforts seem to center on the current trends toward decentralization and distributed authority that seem to permeate many aspects of society—from the political rhetoric of Newt Gingrich to the design of computer networks.

Like politicians and electrical engineers, business people are calling into question the organizational forms and structures that have produced so many success stories in the Industrial Age. In particular, the hierarchical organization forms of giants such as Digital, IBM, and General Motors seem to have lost their ability to successfully organize and coordinate work between large numbers of people, while at the same time allowing adaptation to new market conditions. As a result, long held beliefs of proper organizational design and structure are being called into question. In fact, newer industries such as the software industry seem to be following a new paradigm all together—a paradigm that combines cooperation and competition in a way that befuddles the hierarchical giants.

This thesis examines successful, innovative forms of corporate structure in order to identify key characteristics and requirements of these new forms of organizations. Once these have been identified, they may be useful in creating new or modifying existing corporate or organizational structures in order to deal with the accelerating pace of change.

The study itself seems somewhat of a paradox. How can one study an innovative form of corporate structure, yet claim that this structure is a success? One would think that if a corporate structure was truly innovative, it would also be nascent, and unproved. However, there are some well-established organizations who have innovated in their structure as a result of the unusual demands of their environments. I have chosen to concentrate my analysis on two organizations that have each existed for over twenty-five years, growing to unbelievable size and quietly changing the world as they did so.
The Internet

It is impossible to open a journal these days without being confronted with an article about the use and growth of the Internet. While it is true that the Internet is not a corporation, it nonetheless has an organizational structure that provides for coordination and decision making without central authority. The structure by which this interconnected network manages coordination between its distributed parts can provide valuable insights about how to structure a decentralized corporation or organization.

Visa International

Visa International is a corporation that is wholly owned by the member institutions that issue credit cards under its name. It was purposely architected to distribute power, authority and control to the peripheral components of its structure; it was also intentionally to evolve and adapt as its environment changed locally or globally. I will examine the seemingly unique characteristics of Visa's industry that generated its structure, and then identify how Visa was structured to respond to these demands.

In order to perform this analysis, I am using the concepts and tools developed as part of the Process Handbook Project at the Center for Coordination Science at the MIT Sloan School of Management. By using the process handbook methodology and other organizational and interdisciplinary theory to represent, describe, and explain the success of the governance process of both the Internet and Visa International, I will identify the key characteristics and requirements in common with these two organizations, as well as some important differences that arise from each organization's unique environment and context.

I will try to extrapolate general characteristics of these centralized organizations to describe the generic case of a decentralized organization, and conclude by suggesting how decentralized organizations can best be designed. I also propose that there are numerous organizational successes and failures that can be analyzed and understood via these same characteristics and requirements. This thesis concentrates on the high level corporate structures of the Internet and Visa International rather than analysis of internal procedures. I believe that there is ample room for more cross-industry research, as well as room for intra-organizational research.
CHAPTER TWO
THE TREND TOWARD DECENTRALIZATION
AND DISTRIBUTED AUTHORITY

The Ubiquity of Decentralization

Decentralization is not a new idea. Eastern philosophy has trained Eastern cultures to favor a more decentralized approach since it does not emphasize the power of single omniscient being.1 Similarly, long before there were multinational conglomerates or immense holding companies, the merits of centralized and decentralized organizations have been debated, most often through the lens of politics. Thomas Jefferson's concept of the federal government is without question an expression of the merits of decentralization and distributed authority. The similarities between a federal political structure and that of a decentralized corporation have not escaped writers such as Charles Handy2 and will be discussed in more detail in Chapter Six.

Having noted decentralization's lack of novelty, it is nonetheless important to remark that notions of decentralization are cropping up across multiple disciplines, and that the ubiquity of these notions seems to imply an important trend. For example, Mitchel Resnick has compiled an interesting and varied list of the areas in which decentralization has become a focus:3

Politics

The recent collapse of centrally planned economies is seen as proof that central planning is inherently dysfunctional, while even here in the U.S. the Gingrich congress is vowing to return both authority and responsibility back to the states’ control.

Education

The U.S. is exploring alternate forms of structuring the public school system, allowing each school greater autonomy. In particular, the government wants to use market forces to encourage higher quality education by allowing parents to choose which schools their children will attend.

1 Sardar, Ziauddin, "Conquests, chaos, and complexity. The Other in modern and postmodern science," Futures, Volume 26, Number 6, 1994:665-682.


Technology

Computer architecture has been based on the central processing unit or CPU for some time. Now, engineers are developing massively-parallel processing architectures which leverage the power of many processors working simultaneously. Similarly, the proliferation of personal computers on networks is leading software engineers to design software that takes advantage of the processing power distributed on each desktop, rather than relying on a central mainframe processor for all computational activity.

Biology

As scientists learn more about how the structure of organisms enables evolutionary development, they realize there is less hierarchical control than they had thought in the past.

Psychology

Psychologists are now thinking about knowledge itself as being decentralized. As information is transferred among individuals, each constructs knowledge from that information based on his or her unique experiences and physiology. The implication is that there may not be anything such as a centralized concept of truth.

The above is an intriguing list that leads one to ask what forces might be at work to cause such a wide-spread trend. Resnick says it is antithetical to look for a single root cause when you are studying decentralization. However, there is an unprecedented force at work in our society today that is clearly radically changing the way in which we are able to organize, and that is the force of information technology (IT). With its power doubling and its cost halving every eighteen months, information technology is a powerful lever on the pace of change and the need for innovation around traditional control and coordination paradigms.

The Accelerated Pace of Change

The signs of the accelerated pace of change in the business world are all around us, as Alvin Toffler has described in his books *Future Shock* and *The Third Wave*. For example, only a little more than a decade ago, Peters and Waterman profiled such companies as IBM and K-mart in their book *In Search of Excellence*. These giants have since stumbled and fallen, unable to keep pace with the changing environment around them. As a result, the business press is filled with articles about the causes of the change and tactics for keeping up with it.

At a macro level, we see that people have more information about products and services and are able to make decisions with greater knowledge. They are also more aware of

\[4\] Resnick, 21.

products that are available, and increasingly sophisticated in their ability to evaluate features.

Armed with full information and the ability to source goods over a wide geography, consumers have acquired market power from the manufacturers of good and services. As a result, companies have been forced to differentiate themselves via intangibles, that is non-product specific attributes like customer service, quality, and distribution methods, all of which increasingly effect purchasing decisions. The free flow of information and the geographic dispersion of suppliers has a ratchet effect in that companies must respond quickly to competitive action. Those organizations not structured to do so are quickly overtaken by agile competitors. While there are many other forces at work which are too varied and complex to cover here, the effect is that good tactics for managing change are essential in today's business environment.

**Decentralization Allows Organizations to Respond to Change**

Seemingly there are two ways make an organization more agile. Control can be centralized under one person who has the charisma and vision to anticipate changes in the environment and quickly mobilize an organization to react. Not surprisingly, geniuses who are capable of this kind of leadership and management are few and far between. They are also in danger of relying too much on their intuition, leading them in one direction and causing them to overlook how changing conditions affect their fundamental assumptions about the industry. Nonetheless, if the right person can fulfill the requirements of this role, one will find a highly successful organization that can respond quickly to changes. Many would cite Bill Gates of Microsoft as an example of one of these exceptional individuals.

Given that there is a scarcity of these individuals, how else might you design an organization to enable quick adaptation to changes in the competitive landscape or industrial context? Several authors are touting decentralization as a means of doing just that. Many of the current buzzwords of the management literature refer to various elements of a decentralized, distributed structure:

**Empowerment**

When people talk about "empowering" their workers, they are talking about moving decision making authority to employees at lower levels of the organization. This has at least two effects: employees become more mindful of how their actions can positively or negatively effect the organization, and employees use their specific knowledge and experience to develop the best local solution to a problem or issue.

**Re-engineering**

As organizations examine their processes and procedures, they try to identify what elements of those processes are repetitive, superfluous, or easily automated while separating out exception handling. In evaluating these types of issues, they often look for ways to decrease the amount of central processing that must be done, leaving information
that effects the periphery at the periphery, while centralizing only that which needs to be used by other parts of the corporation.

Outsourcing and Partnering

Another common theme in the management literature concerns what functions of a business should be outsourced or handled through partnerships with other organizations, allowing the business to focus on its core competency. In effect this is a form of decentralization since the business no longer has direct control over functions that have been moved outside, yet it also does not bear the risk and cost of remaining flexible in these functional areas. That is another way of saying that as different functional parts of an organization change at different rates, the organization will have the ability to swap in partners who have developed best practices in these functional areas, while incurring less risk.

Learning to Structure the Decentralized Organization

Decentralized Thinking

Although there is general agreement about the merits of decentralization, there is no recipe for creating a decentralized structure. For one thing, Westerners have a hard time truly understanding the nature of decentralization. In a recent address at the Center for Coordination Science, Mitch Resnick noted that when you ask how a flock of birds determines what direction to fly, people almost always state that there is a leader bird who moves the flock in some direction. In reality, ornithologists have determined that there is no such leader, but that some decentralized coordination method is being used. In Resnick's words, "people assume centralized control where there is none, and impose centralized control where none is needed."

Even Adam Smith, who argued so convincingly the benefits of markets and their lack of central control, could not resist using a metaphor that nonetheless implied it. By saying that the market was guided by an "Invisible Hand," he unwittingly communicated the vision of a singular being somehow guiding the market. Yet the benefits of markets seem to stem from the minimal coordination required. The following definition of market highlights this point:

market. A system of exchange where the demands of buyers interact with the supply made available by sellers, thus in free markets, determining the resulting price...it is preferred to every rival form of distribution, e.g., because it permits the emergence of equilibrium despite the fact that buyers and sellers remain largely ignorant of each other's desires whereas... equilibrium under a socialist planned economy requires an immense amount of, probably unavailable, information about the consumer. (emphasis mine)

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6 Mitchel Resnick, "Can Organizations Behave like a Flock of Birds?" lecture, MIT Center for Coordination Science, April 7, 1995.

Thus markets enable exchanges without the kind of centralized information flows that we often build into mental models of organizations. That is, a buyer in Chicago need not know the motivations of the seller in New York so long as the buyer can purchase goods at a price s/he is willing to pay.

As information technology drives the cost of performing a market transaction down, market-based resource allocation and coordination become more feasible in new areas. Malone et al\(^8\) envision a world in which theoretically all employment could be coordinated through market mechanisms. In such a market, companies needing individuals with a certain set of skills would bid on a day by day basis for those skills. As communication technologies improve, the market reaches more people, and constraints like geographic location become immaterial. Ultimately, you might have millions of one person companies that combine each day via the market to produce ephemeral, transcendent organizations, or as Alvin Toffler calls them, "ad-hocracies."\(^9\)

**A Continuum**

The market also teaches us another important lesson in decentralization: it is not bi-modal but rather a continuum.\(^10\) The market economy in the United States is neither completely decentralized nor completely centralized; a mixture of the two philosophies that includes price supports and trust-busting seems to work to produce the desired results. Similarly organizations will almost always have centralized as well as decentralized aspects.

**Bottom Up Approach**

So far, I have talked about decentralized *systems* at the macro level. However, another important aspect of understanding the dynamics of a successfully designed decentralized organization centers around thinking about how the system can be designed as a federation of similar entities rather than a superstructure with many parts. That is, it is important to view the decentralized organization as a collection of parts, not as a whole. This perspective will be more fully explained in Chapter Six with data from Visa and the Internet that support such a claim.

With this overall trend in mind, we move on to the methodology and analysis of the Internet and Visa International.

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\(^10\) Mitchel Resnick, April 7, 1995.
CHAPTER THREE

METHODOLOGY

Genesis of this Thesis

In the summer of 1994, I was interning at Regis McKenna, Inc., a marketing consulting firm in Silicon Valley. As Regis McKenna's clientele is almost exclusively in the high tech arena, the hype surrounding the Internet had become an important topic for the firm. The clients wanted to know what they could do with the Internet in a strategic marketing sense, and RMI needed to become highly knowledgeable about the topic quickly in order to be able to add value to clients' electronic marketing efforts. Getting the firm to a high level of understanding was a perfect project for a summer intern from MIT, was it not?

I had used the Internet at a previous job, but had not really understood its structure. All I knew was that I could send email to almost any place in the world at no marginal expense to my company. As I began to do research into the Internet from the perspective of how it could be used strategically for business, however, I became fascinated. I came to realize the awesome power the Internet gave to each individual who had access to it, and at the same time, I realized how unique its structure was in that no one was in control of it—by design. Somehow this thing had pervaded the country and many parts of the world, yet it had largely escaped central control and regulation in any meaningful way.

Back at Sloan in the fall of 1994, I registered for Professor Thomas Malone's class "Inventing Organizations of the Twenty-First Century," the purpose of which was to invent, or at least envision, organizational forms of the future given astounding advances in information technology and its ability to coordinate increasingly complex activities across different kinds of boundaries, be they organizational, geographic, temporal, etc. Through the readings in that class and discussion with my peers, I came to see the Internet as a possible model for how such an organization could be structured, and became interested in learning more about how the Internet actually works in an organizational rather than technical sense.

Also as part of Professor Malone's class, I had the opportunity to hear from Dee Hock, CEO of Visa International from 1968 to 1985. Hearing Hock describe the structure of Visa, and hearing why he chose to design it the way he did, led me to believe that Visa and the Internet had much in common. When Professor Malone asked for people who were interested in a structured thesis project at the Center for Coordination Science, I jumped at the opportunity, hoping that I could examine these commonalities in more detail.

As a participant in the structured thesis project at the Center for Coordination Science (CCS), I was assigned to study Visa International, and Professor Malone suggested that a comparison of Visa with the Internet could yield interesting insights. I joined a team of
students who decided to study the two organizations and try to capture their similarities and differences using 1) the emerging concepts of coordination theory and 2) the methods for representing coordination processes being developed as part of the research at CCS. A brief summary of these two topics follows. For a more complete description, see the respective papers defining these theories.

**Center for Coordination Science**

The Center’s work focuses on three project areas:

- **organizational structures**, the study of how people work together and how this may change with new information technology;

- **coordination technology**, the design and study of innovative computer systems that help people work together in small or large groups;

- **coordination theory**, the development and testing of theories about how coordination can occur in a variety of systems, such as human organizations, markets, and computer networks.

Coordination theory draws upon a variety of fields, including economics, computer science, organizational theory, information systems, management science, and psychology.

The Center hopes that by classifying dependencies between the individual activities within a process, patterns of coordination and resource utilization will emerge, upon which theories of effective dependency management can be based. A summary of early research on dependencies appears below in Table 3.1. If indeed these dependencies are the keys to managing coordination, then understanding how they can be managed may help us transform current organizational forms to new paradigms that will be important in the next century. This research is likely to be especially applicable to the increasing fraction of business that are based upon the effective use of knowledge and information.

Of particular interest is how information technology creates new opportunities for coordination. To understand the effects of information technology on organizations and coordination costs, Malone and Rockart used the notion of coordination costs to develop a predictive framework with three orders of effect:

- **First order effect**: automation - information technology will automate coordination tasks and substitute for human activity;

---

11 The team of students was comprised of William Lyon, Tor Ramsøy, and Jon Wilcox. We have all shared knowledge and research about the Internet with each other, and this thesis would not have been possible without their collaboration. In particular, Tor Ramsøy's insights have been essential to the comparisons in this thesis.

12 The discussion of the Center for Coordination Science and the Process Handbook was developed jointly by members of the structured thesis team: Martha Geisler, William Lyon, and Emily Breuner. Some subset of this material appears in their theses by agreement.

Second order effect: increased coordination - as information technology is applied to coordination, its costs go down, and the overall amount of coordination may increase;

Third order effect: coordination intensive structures, - as costs decline and adoption spreads, more "coordination-intense" structures may evolve. 14

In aggregate, these effects have several implications: operations that require a great deal of coordination (virtual corporations, geographically dispersed teams, etc.) may become possible; and, the scale of a coordinated activity can increase dramatically.

Development of the Process Handbook

In order to advance the study of coordination science, Malone and Crowston develop methods for representing, classifying, and then analyzing processes in terms of their ability to coordinate, i.e. manage dependencies. Out of this work has come the Process Handbook.15

The first phase of development focused on process representation and software support. Refinements in these areas continue. The second phase of the development focuses on collecting example processes from organizations. This latter phase generated this structured thesis project. By comparing how various processes manage dependencies and by creating an extensive catalog from which to choose established processes, Malone et al intend the Process Handbook both to help create new processes and to show how different processes might be applicable in new situations.

The Process Handbook Methodology

The principle goals of the Process Handbook project are first to help theoreticians imagine new organizations and second to help consultants, managers, and others understand and redesign existing organizations. The key challenge is devising a notation or representation method for describing processes in such a way that they can be indexed and clearly understood. In order to do this, the process handbook leverages ideas of inheritance from software design and dependency management from coordination theory. The sections below elaborate on the terminology, representational tools and the analysis methods from the Process Handbook.

Terminology

The real value begins with a clear understanding of the terminology used in the Process Handbook. These distinctions capture how this methodology creates a more robust way to represent processes and their embedded dependencies than alternate systems of process representation.


Process
A process is a set of activities to accomplish an objective.

Decomposition
Decomposition means splitting an activity into component sub-activities. This procedure can go through several iterations to further decompose sub-activities into their constituent activities. In general, decomposition of an activity represent Boolean "and" relationships. To complete an activity, each of its components must be accomplished. For example, the activity "pay for purchase" includes several sub-activities "determine amount" and "give amount to seller."

This procedure creates generic sub-routines of activities in a process that may incorporated into other process descriptions, thereby re-using sets of components elsewhere in the Process Handbook.

Inheritance
This term is taken from traditional object-oriented computer programming. In this paradigm, different classes are created. Each class has a set of characteristics that are automatically "inherited" by any sub-class or specific object created in that class. Sub-classes start with the common characteristics inherited from "parents" yet may be modified with further characteristics.

Specializations
In general, specializations represent Boolean "or" relationships. Specializations offer alternate processes to accomplish the same activity. For example, the activity "pay for purchase" could be done at least by at least three specializations: pay with cash, pay with check, or pay with credit card.

A high-level activity may decompose into generic sub-activities. The specializations of the high-level activity each inherit a copy of the activity's decomposition, i.e. the generic sub-activities. Thus each specialization starts with a basic decomposition. These get modified to reflect the unique characteristic sub-activities of each specialization. Thus in the "pay for purchase" example above each of the three specializations would inherit the two sub activities, "determine amount," and "give amount to seller."

Dependencies
Dependencies describe the linkages between activities in a particular process. Of particular note, each dependency requires some method of coordination if the process of which it is part is to succeed.

The following table displays the types of dependencies that have been identified by the Center to date.
<table>
<thead>
<tr>
<th>Dependency</th>
<th>Examples of coordination processes for managing dependency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shared resources</td>
<td>“first come/first serve”, priority order, budgets, managerial decision, market-like bidding</td>
</tr>
<tr>
<td>Producer/ consumer (Prerequisite constraints)</td>
<td>notification, sequencing, tracking</td>
</tr>
<tr>
<td>Producer/ consumer (Transfer)</td>
<td>inventory management (e.g., “Just In Time”, “Economic Order Quantity”)</td>
</tr>
<tr>
<td>Producer/ consumer (Usability)</td>
<td>standardization, ask users, participatory design, concurrent engineering</td>
</tr>
<tr>
<td>Simultaneity constraints</td>
<td>scheduling, synchronization</td>
</tr>
<tr>
<td>Task/ sub-task</td>
<td>goal selection, task decomposition</td>
</tr>
</tbody>
</table>

Table 3.1 Examples of common dependencies and alternative coordination processes

**Representation Tools**

**Activity Lists**

An activity list is simply a chart that provides an opportunity to characterize the activities in a process. Table 3.2 shows a basic blank activity list.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Actor</th>
<th>Goal</th>
<th>Artifacts</th>
<th>Context</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3.2 Sample Activity List

**Process Maps**

These are graphical representations of processes, showing objects arranged in a hierarchical network. Decompositions flow down the map. Solid lines represent this flow. Specializations flow to the right. Dashed lines represent this flow. A heavy arrow shows the dependency between sub-activities.

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In Figure 3.1, the activity “pay for purchase” decomposes into two sub-activities “Determine $” and “Give $.” There are three specializations which can be used to pay for the purchase: pay cash, pay check, or pay credit card. Each of the specializations inherit the two sub-activities (though not shown in this diagram).

Analysis
Documenting processes shows how things currently operate. Analysis looks at best practices and speculates on how people might work together differently, in particular by using new kinds of information technology. Diagramming a process surfaces the dependencies between activities. Then the processes used to manage those dependencies can be identified and represented as well. The Process Handbook serves as a library of processes, organizing by means of a common taxonomy. After mapping a process, analysis of the activities or of the dependencies may reveal opportunities to improve the process’s effectiveness in accomplishing its objective. In addition, processes may be compared across industries to spark new ideas on how a process in one industry may offer insights applicable to another industry's processes.

The Process Handbook Software
Researchers at the Center for Coordination Science are at work on an application that will portray process maps, including activity lists and description screens for each object (process, activity, specialization, or dependency) within the maps. Visual Basic, a Microsoft Windows development tool, serves as the development platform for this application.

Research Performed
In researching this project, I have gathered information from a variety of sources:

Interviews
I conducted interviews with two current Visa employees:

The General Counsel of Visa International, Bennett Katz, and the Deputy General Counsel, David Wagman. Both these men were involved with the legal implementation of Visa's interesting structure.
I also interviewed two former Visa employees:

Dee Hock, Visa's first CEO, and the man responsible for designing Visa's structure, and a great wealth of information because he deliberately set out to invent a new organizational form. This thesis would not be possible without Mr. Hock's participation.

Scott Loftesness, former Visa executive in charge of the development of its information systems which are central to Visa's raison d'être. Mr. Loftesness's insights into Visa are important both because he now works in an organization that performs the same function that Visa does but is structured differently, and because his job function was central to the coordination of Visa's members.

In order to get the perspective of a member institution, I interviewed Deborah Rossi, Executive Vice President of Merchant Card Services for Wells Fargo Bank in California and until recently a member of one of Visa's advisory boards. Serendipitously, she is also developing Internet payment systems on behalf of Wells Fargo Bank.

John Rugo, Director of the Bay Area Regional Research Network (BARRNet) which was recently acquired by BBN, one of the original Internet design contractors.

Additional interviews on the Internet were conducted by Tor Ramsøy with whom I am collaborating in analysis of the Internet's coordinating mechanisms.\(^{17}\)

**Source Materials**

The most important source of information for understanding Visa's structure is the document "International By-Laws and Regional Board Delegations (15 November, 1994). This document clearly defines Visa's structure; it can be thought of as Visa's constitution.

Other sources include articles from journals and a number of books chronicling the history of the credit card industry.

**Diagramming**

Once I had gathered this source information, I developed diagrams using the process handbook notation. Working with Tor Ramsøy and Charles Osborn, a research scientist at the Center for Coordination Science visiting from Babson College, we developed generalizations of the coordination activities of the governing structures of the Internet and Visa International, thereby developing the Generic processes described in Chapter Six.

**Other Important Theoretical Lenses**

In the course of performing this research, both because of Mr. Hock's philosophical views on organizations and because of my own, and in order to understand some of the underlying reasons for the particular coordination mechanisms employed in the Internet

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and Visa International, I explored two other theoretical bodies of knowledge that I used as lenses for understanding these two organizations. One is Karl E. Weick's theory on the social psychology of organizing, and the other is chaos and complexity theory. Both of these bodies of theory are covered in the analysis in Chapter Six.
CHAPTER FOUR
THE INTERNET: ITS STRUCTURE AND GOVERNANCE

History of the Internet

The Internet has been the subject of much media hype in the last few months, but still there are millions of people who do not understand its structure, its nature, or even its purpose. It connects computers and people all over the world and enables two way communication between them, yet is run by no one and everyone. Its decentralized nature is what people find so incomprehensible. The first question people ask is "who runs the Internet?" The answer they get is "No one." For the same reasons that people assume that there is a leader in a flock of birds, they think there must be someone in charge of the Internet.

The Internet started out as a conceptual problem faced by a group of scientists at the Rand Corporation in the early sixties. How could U.S. forces successfully communicate after a nuclear attack? No matter where a central communication center was located, its switches and wires would be vulnerable to nuclear attack, and it would become the primary target. They needed to design a network whose purpose was to enable the exchange of information under any circumstances, and the only way to do that was to build a network with no central authority, "designed from the beginning to operate while in tatters."19

The scientists developed a concept whose principles were simple: the network itself would be assumed to be unreliable at all times. It would be designed from the outset to transcend its own unreliability. All the nodes in the network would be equal in status to all other nodes, each node with its own authority to originate, pass, and receive messages. The messages themselves would be divided into packets; each packet would begin at some specified source node, and end at some other specified destination node, and contain its own separate address. It would be rather like mailing a ten page letter in ten separate envelopes. The post office would not have to keep such a letter together for its journey from the sender to the receiver so long as the letter could be reassembled when it arrived.

Each node on the network would have a list of other nodes that it "knew" about. If the sending node was unable to connect to a particular node, it would try the next one on the list until it made a connection. This process would be repeated on multiple nodes until finally the packet would reach its destination. This rather haphazard delivery system

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19 Ibid.
might be "inefficient" in the sense that a packet would not travel the shortest distance to its destination—but it would be tremendously robust and effective.

Based on some research on this idea, in 1968 the Pentagon's Advanced Research Projects Agency (ARPA) funded a project in the U.S. to connect four supercomputers. The goal was to network these computers in order to share valuable computer time for the sake of national research and development projects. Contracts were awarded to several high-powered defense contractors such as Rand, SRI, etc., who needed to coordinate their pieces of the puzzle and set standards in order to deliver on their part of the project and the project as a whole. The legacy of these standards setting procedures and committee decision processes survives today in the form of the Internet Architecture Board, a volunteer group of individuals who to this day is the only "authority" that evaluates and adopts Internet standards.

ARPAnet, as the project was called, was up and running by 1969, connecting computers through dedicated high-speed transmission lines and distributing scarce supercomputing power around the country. By the second year of operation, however, it became clear that the users had "warped" the network into a federally subsidized electronic post office. People had developed tools that allowed them to send personal messages (electronic mail or e-mail) back and forth, and they were using the network not only to share computing power, but to collaborate on projects, share work-related information, and to "gossip and schmooze." They were far more enthusiastic about this part of the network than they were about long distance computing.

Through the 1970's, the ARPAnet grew. Its decentralized structure made expansion easy as did its well defined standard interface. TCP or "Transmission Control Protocol" converts messages into packets at the source, then reassembles them at the destination. IP or "Internet Protocol" handles the addressing, making it possible to send the standard packets across multiple nodes, networks, and standards. As long as a source or destination machine "spoke" TCP/IP, its brand, ownership, and location were irrelevant. Given the proprietary nature of the computer industry at this time, this interoperability was truly remarkable; the Internet transcended what the market could not, namely proprietary standards.

As the UNIX operating system was developing, its open system approach led it to use the public domain TCP/IP standards as the native networking protocol. UNIX workstations found their biggest market in the research and engineering world, and having this built in capability to "talk " to the Internet only fueled the Internet's growth. As more and more people joined the Internet, its value increased beyond that of the research community just as the value of a fax machine increases the more fax machines there are that can receive documents. This positive network externality effect is an important force in the Internet, and an important motivation for maintaining and enhancing interoperability.

Soon whole networks were joining the ARPAnet, while its own traffic was becoming a smaller and smaller percentage of the overall traffic. The ARPAnet then split into the Milnet and the ARPAnet, and the Internet started to take on its current nature of being a
network of networks. Soon it also took on its current name as people started to talk about the “interconnected network,” and finally the Internet.

**Innovation and Standards**

As the Internet evolved, the clever individuals who used it created new applications for it. File sharing systems like gopher and ftp (file transfer protocol) were developed by Internet "citizens" who wanted to develop ways to make information sharing easier. These applications enabled people to find information on other Internet nodes and transfer them back to their own computers for their own use. The applications were free, as was the information being exchanged. In several cases, a number of redundant solutions emerged from a number of different people. These solutions were usually merely adequate methods of sharing information, but if they were good, they were improved upon by others and then spread rapidly. These types of applications became de facto standards quickly since the Internet itself facilitates the rapid spread of software and information.

As the Internet grew and technology advanced, so did the need for standardization. The committee of defense contractors evolved to become the Internet Architecture Board (IAB), a volunteer committee which evaluates standards proposed by Internet users or technology providers. The process by which the standards are reviewed is explained subsequently in greater detail, but it is important to note that the IAB and its supporting group, the Internet Engineering Task Force (IETF), was not put in place to create standards, but rather to evaluate different standards proposed by users of the Internet and choose ones that were likely to encourage its continued interoperability and growth.

**The World Wide Web and Internet Today**

The world-wide web (WWW) was the invention of some scientists at CERN in Switzerland who wanted to be able to share rich graphical data as well as the text-based data that had been exchanged on the Internet for years. The WWW set up standard formats for storing and displaying such data, and researchers and hackers alike rushed to develop browsers for displaying such data. This new set of Internet applications have taken the Internet a quantum leap from the arcane world of UNIX commands to the point-and-click graphical user interface that has driven the widespread adoption of the personal computer. Now that the WWW has made the Internet more "user-friendly," millions more people are hopping onto the Net to become both content consumers and producers. It is this duality of consumption and production that makes the Internet such a powerful force in today's world.

Perhaps the greatest irony of the Internet is that it was spawned by the fear of nuclear attack, and yet it served a pivotal role in avoiding such an event. The spread of information around the world via the Internet helped to change the conditions in the Soviet Union and encourage the fall of the Communist government there. Because people can gain access to information all over the world virtually without censorship, and also become information providers themselves, the Internet distributes power and authority among people the same way it does technologically among networks.
For these reasons, those who truly understand the Internet feel passionately that it must stay decentralized. However, there is a new group of people who have come to view the Internet not only as a means of exchanging information, but as a means of capturing value. They see it as the Information Superhighway, a distribution medium for goods and services, and thousands of companies have rushed to set up their Internet store fronts. The issue, however, has become one of accountability. It is well and good that an e-mail message can be split up and sent over many routes to a destination. However, imagine a bank using the Internet to enable a customer do her banking from home. If the packet that says "Please transfer $1000 from savings to checking by 5 p.m." does not arrive, and the customer bounces a check, the customer will want to hold the bank responsible. If the packet truly never arrived, the bank will want to hold someone along the transmission system responsible. The way the Internet is set up today, however, that simply is not possible. Nonetheless, as the stakes go up on the Internet, so it seems must the centralized control.

Up until now, the Internet has been quite successful in achieving its goal: enabling the exchange of value under any circumstances. It has done so without being planned, and without anything more than minute government funding ($20 million per year, which is less than the cost of the toilet on the space shuttle). By studying the Internet's current governance process, I hope to learn the secrets of its success so that these "secrets" may be applied to other large scale organizations that struggle with similar issues of coordination, cooperation, and collaboration.

**The Internet Standards Process**

There are many bodies on the Internet which seem to have control over some parts of it. For example, InterNIC, or Internet Network Information Center, is a volunteer organization to whom new Internet nodes must apply for a domain name, or an address on the Internet. InterNIC simply ensures that addresses are unique so that mail can be addressed properly. There is also a group called the Internet Society that is serving the role of an industry association. This group monitors activity on the Internet, puts together facts and figures about its use, and also acts in a public relations capacity. Dave Clark of the MIT Laboratory for Computer Science, and one of the founding scientists of the Internet, said that it also serves as a legal umbrella for the volunteer organization that might be held responsible legally for standards adopted by the Internet.

The truly important "governing" body on the Internet is the Internet Architecture Board, which proclaims standards for the Internet. One must be invited to serve on this board, and it is largely made up of the people who developed enabling technology or have been largely influential in the design of the Internet. While this group is exclusive, its "working group," the Internet Engineering Task Force, is not. Anyone can participate in the IETF, whose meetings serve as a forum to discuss and address the immediate issues that face the Internet as a whole. Problems that interest a sufficient number of volunteers result in working groups that report back to the IETF with a recommendation for solving
the problem. The system seems haphazard, but if the size and growth of the Internet are measures of success, the system works.\textsuperscript{20} As one author said:

\begin{quote}
You should keep one thing in mind about the Internet and its loose controlling structure: it works, and it works far better than do most other organizations. By bringing control down to the low level by requiring cooperation to exist, the Internet works without the strong central government that most countries use and claim is necessary to avoid lawlessness and anarchy.\textsuperscript{21}
\end{quote}

The best way to understand the process is to follow an issue through to standard setting. First, a concerned Internet user brings up an issue on one of the many bulletin boards run on the Net. If there is sufficient interest, the participant(s) will go to the IETF meeting to generate concern and interest there in a "Bird of a Feather" session or BOF. If the group deems the issue to be of significant importance, a working group will be set up to consider various proposed solutions. These solutions take the form of well defined specifications of the standard that are placed out on the InterNIC server in a special information directory known as RFC (for Request for Comments).

Each and every Internet user has the chance to read and comment on the proposed standard(s). Good work is lauded, sloppy work is "flamed," meaning that it is criticized harshly via the bulletin boards concerned with the standard. The working group then evaluates competing standards and decides whether or not each standard addresses the issues raised in the RFC stage. Based on its judgment, the working group will make a recommendation to the IETF who will then ratify the standard; by virtue of having approved the working group in the first place, the IAB has already implicitly given its approval of the standard at this stage. The thing to note here is that the IAB is made up of the "Grand Old Men" of the Internet who rarely use their influence to change or suggest a solution of their own, except when they feel it is absolutely warranted. Of course, they are free to bring up issues through the process as "normal" Internet citizens. Through this process, consensus is reached and standards are set. A process handbook representation of this process appears in Figure 4.1.

The whole process is very clearly documented and the time frames are very tightly set. Academics who have seen the process say it closely resembles the typical academic process used to publish papers in journals or select papers for conferences. Sometimes the participation is overwhelming, but since the rules are clear, well understood and accepted, the process is hardly ever questioned. One person who is relatively active in the standards process put it this way: "The amount of participation increases the noise level, but the fresh air in the system acts as an antiseptic to the radical free agents."\textsuperscript{22} One wonders if this spirit of cooperation and acceptance of consensus decision will hold when large commercial entities like Microsoft begin using the Internet to conduct business, and have interest in setting proprietary standards in order to gain market share and revenue.

\textsuperscript{20} Adam Engst, \textit{The Internet Starter Kit}, Hayden Books, Indianapolis, IN, 1993: 35.

\textsuperscript{21} Engst, 36.

Figure 4.1: The Standards Process of the Internet

Source: Tor Jacob Ramsøy
Dollar Flow on the Internet in the United States

I have described some of the culture of the Internet and how its members cooperate to preserve its interoperability. However, to understand the Internet a little more fully, it is important to understand how the dollars flow through the system that physically makes up the Internet (at least in the United States).

An individual or small business obtains an Internet connection by purchasing equipment to gain access to the Internet (a computer and a modem) and a subscription from an Internet Service Provider (ISP). Currently, there are about 200 of these in the U.S., but this number grows daily. The ISPs provide a phone number and an account on their computer system through which an individual connects to the Internet, with a charge in the neighborhood of $30 per month for such service. The ISPs can be thought of as the retailers of Internet connections, and they typically have customers numbering in the thousands, each of which is using relatively little bandwidth.

In turn, the ISPs receive their connection from wholesalers, second tier Network Access Providers, of which there are about a dozen. These are large regional networks that have very high-speed, high-bandwidth connections to the Internet backbone. Typically, these each have customers numbering in the hundreds, usually of a size that requires a larger connection than what an individual might need. The NSPs' customers are generally small to large businesses and ISPs. NSPs generally charge on a flat fee basis, and agree to route other NSPs' traffic over their networks as part of being on the Internet. Usage among second tier NSPs is assumed to be symmetric, and occasionally it is actually measured. If there is an obvious discrepancy, the fees are renegotiated using trust-based bi-lateral bargaining.

Finally, there is the top tier of the structure, the large NSPs. These top tier NSPs generally have capital investments in fiber optic networks and include companies like Sprint, MCI, and AT&T. There are 7 of these, each of which has about 30 customers, some of which are NSPs and the rest of which are large institutions whose volume of traffic puts them on par with the NSPs. For example, MIT buys service directly from MCI rather than going through a second tier NSP. Since the demise of the federally funded National Science Foundation network, these seven providers make up the "backbone" of the Internet, or the extremely high-bandwidth, high speed connections that handle most of the interregional traffic. These also charge on a flat fee basis, and make periodic bilateral agreements with each of their customers based on the volume of bits going across their networks. Interestingly, within this circle of top tier NSPs, traffic is assumed to be entirely symmetric and traffic is exchanged for free.

Currently, there is plenty of business to go around for all these service providers and they are cooperating fully. However, as the Internet gains in popularity, these service providers will start to compete in earnest for subscribers. Already they are beginning to differentiate themselves in aspects like customer service, security of subscriber networks, diagnostic network software, etc., and there is concern about how long the temptation to compete will be outweighed by the incentives to cooperate. For example, if MCI decides to make a business out of Internet transactions and grabs 40% of the top tier NSP traffic,
the traffic being exchanged between the top tier may no longer be symmetric. These
types of issues are just emerging today.

The Internet is a fascinating example of how an incredibly large, but relatively
homogenous group of people can work together to achieve interoperability. In Chapter
Six, I analyze some of the Internet's interesting features as they compare to Visa
International. Through this comparison, some interesting shared characteristics come to
light, suggesting ways that the Internet can serve as a model for corporations of the future.
CHAPTER FIVE
VISA INTERNATIONAL:
ITS STRUCTURE AND GOVERNANCE

History of credit cards and Visa International

It is difficult to understand Visa’s structure without first understanding how the credit card industry evolved. The history of credit cards is a fascinating topic about which several books have been written. Unfortunately I must leave many intriguing stories to those books, and concentrate on the events that have most impacted Visa’s current structure.

Bank of America

A. P. Giannini, founder and head of the largest bank in California and in the world, built his Bank of America by concentrating on individuals rather than huge corporations. It was not surprising, then, that it was the Bank of America which innovated around the process of extending credit to individuals. Rather than go through the process of approving personal loans for consumers each time they were needed, the Bank of America decided it might be possible to approve a credit line, and then give people an easy way to access it. To that end, the Bank of America launched the world’s first bank credit card, the BankAmericard in Fresno, California in 1958. The card’s success depended on building a critical mass of merchants who would accept the card along with a critical mass of consumers who would use it. As the number of each increased, so did the value of the card since it could be used more widely. Being the largest bank in California, the Bank of America was well-positioned to build a robust network of consumers and merchants.

While consumers were leery of accepting credit because of fears that stemmed from the 1929 market crash and the lean years that followed, many merchants were eager to accept the card. In those days, many small retailers carried accounts for their customers because it was standard practice to do so, and many were struggling under the burden of billing hundreds or thousands of customers for small sums of money. Many small retailers in essence paid the Bank of America 3% per transaction to handle their accounts receivable, but saved themselves much more than that in reduced administrative expenses and bad debt. In this way, the Bank of America became a coordinating entity between merchants and consumers while at the same time continuing to perform one of its core business processes—extending credit. See Figure 5.1-3.
In the mid 1960's, the Bank of America decided that the card would only become more popular and valuable if it was more widely accepted. In order to expand its network of merchants and consumers, the Bank of America was forced to follow a franchise strategy for two reasons. First, U.S. laws prohibited interstate banking. Second, even as large as Bank of America was, it alone could not support the BankAmericard system with the funds necessary for a national network. The float alone would have overwhelmed the Bank of America's resources. Therefore the Bank of America licensed the
BankAmericard to one bank in each state through a separate entity called the BankAmericard Service Corporation. At the same time, rival banks began a confederation called Interbank in order to offer their own card, MasterCharge, to compete with the Bank of America franchise system. In a race to build their networks quickly, both BankAmericard and MasterCharge issuing banks began mailing out cards to any and every person they could identify. The result was massive credit card fraud due to theft and huge losses due to bad credit risks. There were no systems to validate or evaluate credit when a card was used, and the banks hemorrhaged money.

In 1968, the problems had grown so great that a special meeting was called of the BankAmericard franchisees in Columbus, Ohio. Complaints were heard about fee structures, charge-back procedures, and lack of coordination. The problems were egregious enough that banks threatened to bolt to Interbank.

While operational problems were causing licensees to lose money, there were other issues threatening the stability of the licensing arrangements as well. For one thing, the Bank of America was a large bank that was getting in between other banks and their customers. The Bank of America might not be in their states, but the licensing banks were putting the Bank of America’s logo and financial instrument into their own customer’s hands, an uncomfortable activity at best. There was a natural fear of holdup and a strong one-way dependence on the Bank of America that was absent at Interbank, making membership at Interbank much more attractive.

Secondly, having the Bank of America as the issuer brought up sticky regulatory issues that seemed to be more easily mitigated by the Interbank structure. The Bank of America was just too large a force in banking to escape the intense scrutiny of the Justice Department. In fact, at the meeting in Columbus, the Bank of America was little help. It said that because of antitrust law, they couldn’t dictate rules for the group—the franchise banks had to figure out how to organize the system.23

Out of the ensuing confusion, a BankAmericard executive from the National Bank of Commerce in Seattle, Dee W. Hock, provided a glimmer of hope. "While most of the franchisees were concerned with operational problems, Hock saw the whole situation as a massive organizational problem."24 He knew that whatever structure the BankAmericard organization took would have to be radically different from anything that had been designed before. Apparently his vision of the kind of organization that would be capable of coordinating BankAmericard seemed sensible to the other bankers present. The other franchisees confirmed Hock then and there, and that was "the beginning of the end of BankAmerica Service Corporation, and the birth of a new licensing agent, National BankAmericard Inc. (NBI), a for-profit, non-stock corporation owned by its members."25

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25 Kutler, "Metal plates."
Dee Hock and the Formation of National BankAmericard Inc.

Dee Hock was the right man in the right place at the right time. An avid reader of poetry, philosophy, science, etc., Hock had applied many frames to his personal philosophy of organizational design throughout his career. A banker more by chance than by choice, Hock had often been burned when he tried to institute some of his more innovative organizational ideas at his places of employment. Yet suddenly he found himself in a position to apply his organizational philosophy and invent a new kind of structure. Said he, "I had the idea that there should be a device for the exchange of value. There was no organization available. No existing organization could even begin to think of it."26

Hock and his committee of bankers retreated to a hotel in Sausalito, California to try to envision the structure of the new organization. He says he began with a purpose, "enabling the exchange of electronic value," a vision far more expansive than that of his peers, and then set out to devise some principles by which to achieve that purpose:

- it must be equitably owned by all participants
- power and function must be distributive to the maximum degree
- authority must be distributive within each governing entity
- it must be infinitely malleable yet extremely durable

Using these guiding principles, Hock and a small hand-picked staff created NBI, which opened for business in 1970 with 243 charter members. In 1977, NBI changed the BankAmericard brand name to Visa, and similarly renamed itself Visa International. Since 1970, Visa has grown to handle approximately 50% of credit card transactions, way ahead of both American Express and MasterCard. Just recently, Visa broke industry records by doing $630.6 billion in sales with 391 million credit card holders and over 12 million merchants through over 20,000 member institutions.27 Yet it has accomplished this with a small corporate staff and little fanfare.

According to Hock, "it took six months to get the principles and two years to get the organization right."28 The results are apparent, and Dee Hock himself expressed many of Visa's incredible characteristics in a speech given at MIT in the fall of 1994.29

The Visa Governance Process

Now that the story of the conditions that generated Visa have been told, it is time to turn to the details of Visa's structure. First I will provide a narrative description of Visa in terms of the By-Laws which structure the Visa International corporation and its supporting regional corporations, and then I will use the Process Handbook notation to illustrate the governance process and its dependencies.

26 Green, "Power pyramids."
29 Dee W. Hock, "Out of Control and Into Order," seminar, MIT Center for Coordination Science, September 27, 1994.
What is it and what does Visa International do?

Structure aside, it is important to ask what it is that Visa International and its member corporate organizations produce. If you ask any Visa card holder what Visa is and what it does, you will most likely get the answer "they issue credit cards and sign up merchants to accept them." Then the cardholder might reflect for a moment and realize that they do not obtain a Visa card from Visa, but rather apply for it at a bank. It is also a bank that produces statements, collects payments from customers, and makes payments to merchants. What then does Visa International actually do?

Simply put, Visa International is a corporation whose product is coordination. While Visa International executives say that their product is the Visa brand and the interchange network that clears payments between member institutions, in a sense, all the people at Visa International are working to coordinate the efforts of hundreds of member institutions. This is reflected in the fact that the Visa International organization is small compared to the volume of money it handles.

How can Visa International, which has had such a huge impact on the world and people's ability to exchange payments, operate with a staff of about 2,000 world-wide? Because most of the work of building the number of cardholders and merchants is done by the member institutions. If one were to count the employees who deal with administering the Visa program at Citibank, the largest Visa issuer, along with the similar staffs at each of the 20,000 member institutions, as part of the Visa International staff, they might number in the hundreds of thousands. While those people do not actually work for Visa, the coordination of their efforts is Visa's primary concern.

The staff at Visa International delivers Visa brand marketing that benefits all members, that is marketing programs that convince cardholders to choose Visa over other credit cards (e.g., the popular "and they don't take American Express" ads as opposed to the member-specific ads, e.g. "Not just Visa, Citibank Visa" ads). The other key function at Visa International is the development of the interchange and credit authorization system, the quality of which dramatically effects the profitability of member banks' Visa programs since it lowers the cost of each transaction and the amount of fraudulent credit, and quickly uncovers bad debt.

In legal terms, Visa International is a corporation with a board of directors made up of representatives of its member organizations. It is incorporated in Delaware, which is known for its liberal incorporation laws, and headquartered in San Francisco, CA. It is owned by the member banks who issue its cards and who pay for their ownership in the corporation in the form of service fees based on the volume of transactions their merchants and cardholders generate. The Board of Directors is made up of board members from legally separate regional Visa organizations, and in turn there are national and group member corporations under these regional entities. For a map of the entities

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30 An observation made by Jon Wilcox, Sloan Master's student, in class discussion in course 15.579 at the MIT Sloan School, Spring, 1995.

and the flow of service fees between them, see Figure 5.5. Membership is granted to any organization that is "fit" for membership as outlined in the By-Laws (e.g., the organization must be a lending institution), but each member must agree to abide by the By-Laws and Operating Regulations of the Visa International Corporation. Violating this agreement is grounds for revocation of membership.

Conceptually, Visa can be thought of as a number of things, and indeed it is viewed through many lenses. Dee Hock calls it an inverse holding company, yet notes that it has properties in common with a government such as taxation, delegated authority, and rights; the General Counsel refers to it as a joint venture; a board member calls it the Association;\(^{32}\) it might also be called a consortium. In many ways, the organization is whatever you want it to be depending upon your vantage point because it is purposefully loosely defined. The By-Laws are simply a collection of meta-rules that specify how regulations will be made, and where the authority to do so resides. The majority of the document specifies rules for meeting and voting procedures and still it is a scant 62 pages, testimony to the fact that it tries not to be more specific, and therefore more rigid, than it needs to be.

**The Structure as Set Forth by the By-Laws**

Although Visa is decentralized, it is also a hierarchy of regional organizations; the Visa International organization is at the top of the hierarchy, and under it are regional organizations that help manage the member institutions and help reach local consensus among them. In some cases there are additional sub-regional organizations below the regional corporations, again to manage member institutions if there is a sufficient number to warrant it. The hierarchy is a fascinating part of Visa and its purpose is explained more fully in Chapter Six. However, it is not a traditional hierarchy in the sense that there is no superordinate layer; each layer of the hierarchy has the authority it needs to coordinate the system at that level, but each also concedes some rights to the other layers. The specific rights and obligations of each group is outlined below,\(^{33}\) however, it should be noted that there are exceptions to almost all these rules. Each regional organization has certain grandfathered rights, but overall these are the rules that govern sub-structural behavior. In most cases, the By-Laws are paraphrased to avoid the confusing and detailed legalese. Table 5.1 summarizes these details at the end of this section.

**Issuing Institutions or Member Banks**

This layer is very autonomous, and has more responsibility and thus accountability to the customer and the government than any of the other layers. It has the right to devise and market any set of products so long as they conform to the By-Laws and Operating Regulations (e.g., the card must have the Visa logo and hologram on it), and all the rights

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\(^{32}\) Deborah Rossi, Personal interview, March 23, 1995.

\(^{33}\) Visa International By-Laws and Regional Board Delegations. Visa International, November 15, 1994. All parenthetical page numbers refer to this document.
not specifically delegated to governing corporations or their boards. Otherwise it is beholden only to its own corporate policies and those of its local government.

**National Organizations:**

In some cases, the number of issuing institutions in a single country does not warrant a sub-organization under the regional structure, but in some countries there is such a need. In most first-world countries, there is a Visa national organization that is chartered by approval of Visa International, the regional board, and a vote of the national institutions. Visa International retains the right to manage the staff of these national organizations, but can also grant autonomous management with a two-thirds vote. These organizations have the following rights and responsibilities:

- have the authority (i) to develop and implement products, services, systems, programs, and strategies to address the unique market conditions in each country, (ii) coordinate member activities, (iii) promulgate rules, regulations and policies applying to members operating within such a country (1-45)
- have the responsibility to maintain appropriate records (1-19)
- must ensure that the board is made up of a representative cross-section of members operating within the country (1-46)
- are accorded votes based on sales volume (1-46) and has the right to ratify changes to the By-Laws with a membership vote (1-20)
- may assess service fees and other fees to cover cost of operations
- members must conform the rules set forth by the national organization so long as the rules comply with those of the region in which it is located
- by legal contract, are liable for its actions.

The grounds for revocation of authority are as follows:

- if the group is unfit (e.g., insolvent)
- if the national group makes unreasonable terms of membership so as to prevent a bank becoming a member
- if the board membership represents less than 51% of the sales volume
- if eligibility requirements for voting and directorships are materially changed from those approved by the board

**Group Members:**

In addition to the rights accorded the national organizations:

- may consist of one to many national member(s). This grandfathers Visa USA and Visa Canada as both group and national members.
- has rights to products, services, systems, software and intellectual property of Visa International
- is entitled to license the software know-how, and other proprietary information necessary to interface with the systems
- must agree to license to other members the technology and products it develops
- has the right to request services from other organizations upon reasonable terms and conditions
- rights of national group membership supersede obligations as a regional group if the organization fulfills both capacities (as happens in the U.S. organization Group USA)
- cannot refuse membership to any fit institution wanting to become a Visa issuer

**Regional Boards:**

Fundamental Principles ((1-42) guiding the authority and responsibility of Regional Boards:
The authority to regulate purely interregional matters resides exclusively with the Board of Directors of Visa International.

The authority to regulate intraregional matters resides exclusively with the Regional Board.

The authority to regulate intraregional matters that may effect the whole Visa program resides with the Regional Board until preempted or regulated by the Board.

The Board of Directors of Visa International has the right to decide the nature of a matter. In evaluating matters submitted for its consideration the Board of Directors shall be guided by the general principle that it is in the best interest of the corporation and ultimately of its members that an environment most conducive to the continued development and enhancement of the corporation's worldwide payment systems be maintained.

Rights and Obligations (1-43)

- establish policies and promulgate rules and regulations regarding the administration (including but not limited to the admission, termination, change of class and conditions of membership and/or ownership of any organizations headquartered in the region,) operations and development of the corporation's programs within its region which are consistent with Visa International.
- ensure that products, services, systems conform with the standards set by Visa International.
- use its best effort to promote the products services and/or systems of the corporation through its region.
- may administer membership
- may manage operations.
- may set services fees so long as the aggregate Service Fees are not less than those which would have been payable pursuant to the service Fees established by Visa International.
- may spend corporate funds for the benefit of the Program within the region.

Appointment of Regional Board Members (2-2)

- any bank that makes up 25% of total service fees paid by the region gets one member, 50% gets two members, 75% gets three members.
- the regional shall be divided into subregions based on volume and each subregion shall elect a number of directors based on volume.
- a regional advisory board can be appointed by the Regional Board.

Conflicts and Controversies (1-43)

If a conflict (i) violates the Bylaws and Operating Regulations, (ii) adversely affects members in other regions, it may be submitted to the Visa International Board of Directors for consideration. A ruling in the matter, once it is deemed interregional, shall be binding.

Visa International:

Number, Qualification, and Election of Directors (1-23...25)

- must be a ranking officer in a member institution
- elected by and from the Regional Boards
In general, the number of Board member elected from each region is based on percentage of sales volume; special “at large” directors may be elected by regions in certain cases; the President of Visa International shall be a Board member; the Bank of America shall retain the rights to appoint one director; the Board of Directors may appoint nonvoting Board Advisors of the Board of Directors (up to five).

Powers (1-27...28)

- may establish a national, group, or regional board which has the rights listed above (1-24)
- may set minimum service fee
- may manage business of Visa International
- may establish regional boards
- may rescind regional boards
- may enforce payment of fees
- may admit or expel members
- may amend International Operating Regulations by 2/3 vote
- may amend By-Laws by 3/4 vote
- may form committees made up of members of the board to deal with issues
<table>
<thead>
<tr>
<th>Level</th>
<th>Funding</th>
<th>Membership Authority</th>
<th>Responsibilities</th>
<th>Authority in Issues</th>
<th>Comprised of/Owned By:</th>
</tr>
</thead>
</table>
| Visa International | Service fees set by Visa International      | Sets guidelines for membership and reviews the practices of subordinate entities | • manage Visa International Corporation  
• establish regional boards  
• may rescind regional boards  
• may enforce payment of fees  
• may admit or expel members  
• may amend operating regulations  
• may amend By-Laws  
• may form special committees | has the authority to decide what issues are inter regional and to settle such issues | The board is comprised of regional board members who have been duly elected, and the organization is owned by all members in accordance with the service fees paid based on sales volume |
| Visa Regional | Surcharge on service fees that are set by the Regional Board | Has the authority to set membership rules as long as they conform with the Intl By-Laws | • to oversee membership, operations and the development of programs  
• ensure conformity with Visa Intl  
• promote the products, services, and systems of Visa Intl | has the authority to decide all matters unless they adversely affect other regions in which case the Intl Board settles the dispute | Comprised of Board Members of the Subregions  
Owned by the Regional Members |
| Visa Group Members | may assess service fees and other fees to cover the cost of operations | may not refuse membership to any fit member | • has the authority to develop products, systems, programs, and strategies  
• coordinate members  
• promulgate rules  
• liable for its own actions  
• has the obligation to license innovations to other groups for reasonable terms | same | Must be representative of the member groups in its region |
| Visa National Members | same | same | • same except the national organizations may retain the rights to their innovations | same | same |

Table 5.1: Summary of the Characteristics of Visa International and its Supporting Regional Corporations
The Board Meeting Cycle

Visa International's business is largely determined by the Board meeting cycle. Issues and budget approvals start at the functional advisory board level, a network of committees that have knowledge in specific functional areas, e.g., debit cards. Visa International staff prepare highly structured documents (prepared in the Queen's English rather than American English to reflect Visa's international nature) that are presented to the appropriate advisory Board. If the Board approves the project, the Visa International staff must then go on a circuit to all regional Boards to present and to gain acceptance. Finally, the project is presented to the International Board for final approval. At this point the project is well understood and will probably be passed without much debate. The typical cycle from initial presentation to approval is six months, and according to Visa employees, it is this cycle that drives the business and the internal organization of the Visa International Corporation.

The Governance Process

The important governance process at Visa International and within all the substructures is largely the same. Each uses a standard board process to consider issues of the organization and then make and implement decisions based on the authority outlined in the By-Laws. Because each level of the board hierarchy has similar powers, these board activities can be thought of a specializations of the generic "Govern Visa Entity" diagram below:

Each level of the hierarchy performs these functions. They indirectly affect membership and products via their responsibility for managing the corporate staff of the entity that implements programs and member services. While there are some subtle differences between, say, the responsibilities of the national board versus the regional board, overall the system and activities are the same—so much so that board members are elected at each level to serve on the next level higher, and can do so with little difficulty.

Within the board process and activities themselves, the major dependency that needs to be managed (represented by the arrows) is usability of information which is accomplished through standardization both of the board process and of the documents used therein. The Board meeting cycle is clearly understood and constant as is the structure of the documents that are prepared for presentation to the various boards. Therefore, no matter how complicated or unpredictable the issues are, the process for dealing with them helps to standardize the data in such a way that it can be constructed into knowledge as quickly as possible.

**Service Fee Flow through Visa**

It is not entirely apparent in the By-Laws how the fees flow through Visa, but it is basically a pyramid structure. The member banks determine whether or not to charge an annual fee to their cardholders, and also determine how much that fee will be. They also may offer any interest rate and grace period on the cards. Their relationship with their customers is unregulated by Visa. Similarly, the member banks may set up any agreement with merchants for accepting the card. Usually this amount is 3% of the purchase price. The member banks then pay a quarterly service fee based on volume to
their national, group or regional organization at the rate set by Visa International plus any surcharge fees established by National, Group, or Regional organizations between the member bank and Visa International. Each level of the hierarchy takes its board-approved "cut" and passes on the proper balance on to the next level of the hierarchy, all based on volume.

Although each organization in each level of the hierarchy is set up as a for-profit entity, all strive for zero profit as a result of unfavorable tax consequences of making a profit which is then distributed to the member-owners and taxed twice.

A diagram of the service fee flows follows:

![Diagram of Service Fee Flows through Visa]

Figure 5.4: Service Fee Flows through Visa

It should be noted that there are also interchange fees that flow from the "acquiring" bank, i.e. the bank that acquires the merchant as a card-accepting institution, to the "issuing" bank, i.e. the bank that issued the card to the card holder. The specifics of how these fees flow between member institutions is set at the regional level and therefore varies by region.35

35 From discussions with Center for Coordination sponsors National Westminster Bank, May 15, 1995. Further research into the regional Visa organizations would yield more specific details.
The Significance of Visa International’s Structure

Visa’s structure is interesting because of the balance it strikes between centralization and decentralization, cooperation and competition, and because of the number of problems inherent in the old franchise structure that the Visa International structure solves. A description of these strengths and weaknesses follows with the trade-offs they embody summarized in Table 5.2 below.

Strengths

• Visa itself does not issue cards, therefore it is not in competition with member institutions as was Bank of America. This fact alone facilitates much more cooperation.

• Visa does not itself extend credit, which frees it from the archaic and arcane bank regulations in numerous countries.

• Visa gives great autonomy to banks—specifically the ability to establish their own products and services. By leaving the power and authority at this level, a great deal of coordination and consensus building is avoided while the benefits of competitive forces, such as diverse and rapid product innovation, are preserved.

• Visa must earn its service fees, as banks are not required to buy any services from Visa International. This keeps Visa International staff from becoming complacent and gives an incentive for innovation at the International, Regional, Group and National level.

• The democratic voting system keeps any one bank, nation, group or region from becoming dominant and able to act in its own self interest. That is not to say that there aren’t dominant forces, but there are also some checks and balances.

• Because Visa International can create new levels of hierarchy, different regions and subregions can be raised or lowered to the appropriate level of the hierarchy in which they will find peers. For example, Visa Europe may soon be split as Eastern Europe and Western Europe because the volume in Eastern Europe has put it on par with the other regional levels.

• Visa allows for emergent product innovation at the lower levels so that optimal local solutions are reached, but also has the infrastructure in place to react fairly quickly to threats introduced from competitor.

• Visa's decentralized architecture is supported by a decentralized information system, keeping operations aligned with governance and diminishing central control. For example, intraregional interchange is cleared intraregionally;36 the European system only communicates to Visa International's systems in aggregate form the interchanges involving banks in two regions.

• Visa International's control over membership means that Visa has a way to control the "Prisoner's Dilemma" within the Visa program: the natural incentive for Bank A in one geographic area to try to keep other banks within its area from gaining membership, giving Bank A a Visa card monopoly. Instead, if all banks cooperate, then there is greater potential for a higher volume of transactions because all customers of Bank A can purchase from Bank B's merchants and vice versa; everyone is better off since banks make money on each transaction, as well as on total dollars spent.

• Visa International has the power of the purse; that is the money from the service fees gives it the autonomy it needs to develop strategic initiatives such as the central interchange system or new technologies without having to build consensus from the bottom up each time.

Weaknesses

• When asked about the weaknesses of Visa's system, each person interviewed used the same word: inefficient. Those inside the organization felt that they couldn't get decisions made quickly. Using a political analogy, Bennett Katz reflected that the most efficient form of organization is a dictatorship in which a strong leader makes a decision and the whole organization reacts quickly moves in one direction. Visa does not have that kind of mobility. However, there are many other organizations that never reach consensus, such as standard setting bodies in telecommunications or software. Perhaps more regularly, standards are set, and one major competitor sets a proprietary standard anyway, giving in to the temptation to take advantage of those who cooperated. It may be inefficient, but Visa seems to have avoided pitfalls of this type.

• Another weakness is that strategic decisions have to be made with the lowest common denominator in mind. For example, smartcard technology has been around for years, and Carte Bleu in France implemented it long ago. In determining how Visa International could encode information on a card, however, it had to go with a technology that fit the needs of the countries with the poorest infrastructures. As a result, the magnetic strip was chosen because it was "serviceable technology" that best fit the kind of telephone infrastructure that was available in most countries.


### Table 5.2: Centralization/Decentralization Trade-Off Matrix

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<thead>
<tr>
<th>Dimension</th>
<th>Centralized (Bank Americard)</th>
<th>Decentralized (Visa)</th>
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Dee Hock was well aware that running a large organization by consensus would be inefficient, but he thought it would be tremendously effective. Given the Visa logo is recognized and the Visa card is accepted anywhere in the world, I would have to say he was right. The distinction between efficiencies and effectiveness will re-emerge when I look at Visa as an adaptive complex system in Chapter Six.

#### Federalism and Visa International

The parallels between Visa and forms of Federal government are unmistakable and entirely intentional. Dee Hock based most of his organizational ideas on the wisdom he garnered from his reading of philosophy, the classics, science, etc. Similarly, Bennett Katz, Visa's General Counsel and one of the main authors of the By-Laws stated that he relied heavily on the concepts embodied in the U.S. Constitution to construct the By-Laws.

Jeffersonian Federalism stated that the Federal government should only have the powers to regulate interstate matters while leaving the authority of intrastate matters entirely to the state governments. The goal was to establish a set of principles by which the larger community agreed to conduct itself. No one could predict what types of conflicts would arise, but they knew that in order to settle them or make further legislation, they would need to evaluate issues in light of the agreed-upon principles. Visa was set up in much the same way. This topic will be explored further in Chapter Six.
Cooperation and Competition

In Hock's view, a critical part of the organization would be the way it dealt with the notions of cooperation and competition. Hock felt that these two things were two sides of the same coin, and that properly managed, members working both against and with each other would build a powerful organization. Thus he built in cooperative and competitive forces at all levels of the organization. In general, Hock skillfully used cooperative forces where he wanted effectiveness, and competitive forces where he wanted efficiency. The interplay of the two seems to bind the system together the way positive and negative charges in a molecule are always attracting and repelling. This is a point that will be explored further in the Chapter Six.

How Might Visa's Method of Coordination Be Improved?

It is difficult to imagine a way to structure Visa that would better fit its need to preserve banks' autonomy while coordinating their activities. One possible change in structure would be to move away from a geographically-based hierarchy. Visa's network is more logical than it is physical, conceivably the subgroups under the international structure might better be arranged along some other dimension. For the moment, however, the cultural and regulatory forces in the banking industry are still quite strong, and are best classified by geographic location. There may well come a day when some other logical organization makes sense that might require a dramatic change in Visa's structure. The By-Laws provide for such a change, and it seems likely that the guiding principles are broad enough that they will still apply.

Looking into Visa's Future

In trying to discern if Visa's structure is truly able to withstand change, I imagined a situation that would still fit within Visa's defined purpose, but which Visa doesn't currently do today. What if Visa allowed cardholders to both make and accept charges? That would still be a form of exchanging electronic value, yet it would mean new operating procedures and further responsibility for the bank. However, I could not see how a new function like this would upset Visa's structure in any meaningful way. It may well be that smartcard technology will enable such transactions soon, and Visa will be well-positioned to operate such a new service.
The test of a first-rate intelligence is the ability to hold two opposed ideas in mind at the same time and still retain the ability to function.

— F. Scott Fitzgerald

If there is one generalization of decentralized organizational structure that can be drawn from a comparison of these two organization, it is this: on several dimensions, it is the interaction of opposite forces that makes them resilient, robust, and successful. Just as a positive and a negative charge keep a molecule together, opposite forces seem to be the stabilizing forces in both the Internet and Visa International. Competitive forces are used to manage cooperative inefficiencies, while cooperative activities are used to build more effective but less efficient solutions. Hierarchical architecture is used to make the organization more flat, and those who earn the most respect have the least incentive to force a solution. It is the “yin and yang” that makes these organizations work, not the linear, bi-modal thinking that has shaped organizations in the past. I have found two theoretical systems especially applicable in making sense of these apparently paradoxical organization structures: complexity theory and Weick’s theories on the social psychology of organizing. I briefly summarize these theories below and go on to analyze both the Internet and Visa International in light of them.

Important Analytical Lenses

There are many fascinating aspects of both the Internet and Visa that suggest that they can best be viewed as biological analogs, or biologs. Indeed it seems the world will never be without an Internet or a Visa card again; they have literally taken on lives of their own. In describing his vision of Visa, Hock often uses biological references to the brain and other organisms. He also refers to this type of organization as a “Chaord,” a combination of the maximum chaos possible with the minimum amount of order. These concepts are congruent with the emerging science of complexity theory, which appears to be a useful theoretical framework for understanding why and how these two organizations have so successfully organized to create platforms that have effected fundamental change around

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30 Dee Hock, September 27, 1995.
the world, especially when complemented by Weick's theory on the social psychology of organizing.

**Complexity**

The emerging field of complexity theory deals with the relationship between chaos and order in complex, adaptive systems. By nature an interdisciplinary field, it encompasses biology, physics, psychology, economics and a wide range of other fields. Some have called it the Theory of Everything, and at the very least it is the search for the Theory of Everything, a single unifying rule that explains (but will probably not predict) the behavior of all things.

Complexity has gained wide recognition, as some of the world's most famous Nobel laureates have validated this new science by founding or becoming involved in the Santa Fe Institute. A non-profit, multi-disciplinary research center in New Mexico, the Institute is meant to be a forum for scientists to exchange ideas from their areas of expertise in order to facilitate the development of complexity theory.

Complexity theory is based on the belief that it is the interaction of the behavior of many individuals or "agents" that causes dynamic change in any system, and the sheer number of interactions means that the evolution of any system is unpredictable. This idea was born when Henri Poincare realized that if a system consisted of even a few parts that interacted strongly, it could exhibit unpredictable behavior. "For example if three planets orbit around one another influenced only by the force of gravity, it is impossible to predict the motions for a long period of time, even if the positions and velocities of the planets are known with great accuracy."40 This strikes at the very heart of all the beliefs we have established as a result of centuries of linear, Newtonian, scientific thought. Not only are we not able to control the world around us, but we are not even able to use the laws we understand to predict it!

"Investigators began to wonder if they could apply the emerging theory of complexity to adaptive systems...Adaptive systems like other complex systems, consist of many relatively independent parts that are highly interconnected and interactive...An adaptive agent can be anything from a single cell organism to human society; it must be capable of forming and changing strategies. For instance, an aspen will orient its leaves to capture the most sunlight, a strategy that is encoded in its genes, and can change through mutation or recombination of genetic material. Complex systems learn and adapt to changing conditions in the environment with which they interface."41

The following simple example illustrates a complex adaptive system:

- Agents have rules that determine their structure and/or behavior (e.g., a frog's genetic make-up suits it to eat insects)


41 Ibid.
- Agents' behavior combines to change the condition of their common environment (a bird also eats insects, causing a shortage of insects)

- Agents adapt to these changes by adopting a competitive strategy (the frog eats the insect larvae before they become food for the bird) or a cooperative strategy (the frog switches to eating algae)

![Figure 6.1: A Representation of a Complex Adaptive System](image)

Other important aspects of complex adaptive systems:

- The independence of agents adapting to environmental changes spawns multiple solutions, several of which are successful. The diversity of solutions creates diversity in the population, which in turn creates niches. All this change is inherently incremental since each is a real-time response to a change or opportunity in the environment.

- The independence also promotes survival of the species since it is likely that one or more solutions will succeed.

- Agents usually base adaptations on feedback from the environment.

- Agents must have the ability to adapt, or mutate and to preserve or replicate the learned adaptation (e.g., via DNA) and possibly anticipate the future based on that learning.

Of course, in the simple example above, the frog's adaptation changes the environment in ways that affect other agents apart from the bird, such as the algae and the insects. These agents also adapt, and soon the number of possible adaptations and their interactions
becomes infinite, and thus the evolution of the system becomes completely unpredictable and chaotic. Yet the world is not chaotic and systems seem to stabilize. How this order evolves from chaos in adaptive systems is the subject of complexity theory.

A key insight of this theory is that the loose relationship between many parts of the system that creates stability. Agents that are too dependent on one part of the system have a greater chance of failure, while agents that are slightly dependent on many parts of the system are insulated from the risk that one change in the environment will cause extinction. Thus, a network of dependence causes stability.

While there is chaos, systems of all types have a propensity to reach local equilibrium or order before evolving in some new direction. Our instinct until recently has been to analyze a part of a system in isolation to look at the forces that drive it to equilibrium, which is a very linear and Newtonian perspective. This is exemplified by the economists' standard statement at the end of every proof—"all things being equal."

What does complexity teach us? Many systems can, in fact, be thought of as complex adaptive systems. The key drivers of such systems are the cooperative and competitive strategies of the agents within the system, and because all these strategies are interacting in unpredictable and uncontrollable ways, a system's behavior and evolution are also unpredictable and uncontrollable. Thus, management of such a system should try to capitalize on these forces in ways that are consistent with the system, rather than trying to control them. These ideas obviously have implications for both the Internet and Visa which seem easily characterized as complex adaptive systems.

Subassemblies and Cycles

In his book The Social Psychology of Organizing, Weick explores the psychology behind the development of organizations. The book is rich with important information, but two of its concepts are especially applicable to understanding the Internet and Visa, especially when taken in conjunction with complexity theory (which Weick seems to have anticipated in some ways).

Subassemblies (or Agents)

Weick\textsuperscript{42} tells the parable of Hora and Tempus, two watchmakers that were interrupted frequently in their work by people calling to order watches. Hora was able to survive and prosper while Tempus soon went out of business. Why?

The idea relates to complexity theory's concept of agents in that it involves the interactions of many sub-units. The watches made by each man contained 1000 parts. The watches Tempus made were constructed so that if one of them was only partly assembled and he had to put it down, it fell apart and had to be reassembled. Thus, if Tempus got a phone call before a watch was finished, he had to start all over.

Hora's watches were just as complex as Tempus's, but they had been designed so that they could be put together using subassemblies of ten parts each. Ten of these subassemblies in turn could be assembled into a large subassembly and ten of the larger subassemblies could be assembled in the 1000-piece watch. Whenever Hora was interrupted, then, he lost only a small portion of his work.

The parable's crucial implication for our concern with organizing is its suggestion that the time required to create a large organization from simple components depends critically on the number and distributions of the potential intermediate stable forms. This is a vast simplification but it does give us a tool to use in comprehending complexity...The notion of stable subassemblies implies that when a set of subassemblies are aggregated, there will be strong ties within the subassembly and weaker linkages between subassemblies. The bond of most subsystems, in most organizations, should be relatively loose. This means that both stability and adaptation are achieved with less interdependence, less consensus, less mutual responsiveness than we usually assume.

...The combination of stable subassemblies composed of double interacts and of loose coupling among double interacts is attractive when pondering organizations because it suggests the conditions under which evolution can occur quite rapidly, adaptation can be preserved and adaptability can also be maintained. Subassemblies and loose coupling provide the potential for flexibility as well as stability. (p 110-112)

Rules for Assembling Interacts (Dependencies)

Weick then goes on to describe rules for assembling double interacts which are defined as follows:

Processes contain individual behaviors that are interlocked among two or more people. The behaviors of one person are contingent on the behaviors of another person(s), and these contingencies are called interacts. The unit of analysis in organizing is contingent on response patterns, patterns in which an action by actor A evokes a specific response in actor B (...this is an interact), which is then responded to by actor A (this complete sequence is a double interact).\(^{43}\)

It easily follows then that by constructing these double interacts, which in coordination theory would be labeled dependencies, Weick is suggesting rules for developing coordination processes among agents, or what he calls subassemblies. He goes on to suggest that the way this coordination is structured depends heavily on the characteristics of the information being processed by the subassemblies:

(In assembling double interacts into subassemblies and processes,) we presume that the actors use the following meta-rule (a rule about how to choose rules). The greater the perceived equivocality present in the input, the fewer the number of rules used to assemble the process...However if the input is judged to be less equivocal, there is more certainty as to what the item is and how it should be handled; hence a greater number of rules can applied in assembling a process to deal with this input.\(^{44}\)

I have interpreted this passage as saying that when the types of problems coming into the system are fairly well structured, many rules can be codified that will handily deal with

\(^{43}\) Weick, 89.

\(^{44}\) Weick, 114.
them with a process needing relatively few steps or cycles (i.e., time). However, when there is uncertainty about what kinds of problems an organization is going to deal with, few rules can be specified, but many steps will be invoked as means of defining the problem space.\(^{45}\)

Both complexity theory and Weick's concepts of subassemblies and the equivocal nature of information are important in analyzing Visa and the Internet and understanding the success of their respective governance structures. Each of these perspectives is applied below to several aspects of that success.

**Agents of the Complex Adaptive Systems that are the Internet and Visa**

In order to use these bodies of theory to look at the Internet and Visa, one must identify the "agents" or "sub-assemblies," not an easy task with respect to the Internet. In one sense, the agent is the end-user, since it is the interaction of all end-users that most effects what goes on in the Internet. However, at this point in time, end-users' ability to gain access to the Internet is determined by the cooperative actions of the organizations that supply network access. With respect to Visa, the card holders and merchants also are important features, but the structure is explicitly designed with the view that the member bank is the natural unit of stability. Thus the following analysis is done with the Internet access providers and the member banks as the agents.

**Diversity**

It is important to note that neither of these agents are highly dependent on the other agents in their respective systems. Each is autonomous and free to develop its relationship with its customers independent of the other agents in the system, and few have tied their fates closely to others'. This provides some stability. It also means that as each develops in a certain direction, they do so without endangering the survival of the group as a whole. For example, if BayBank develops a Visa product that causes BayBank's collapse, it neither damages Visa or the other members. Conversely, the fact that these independent agents are working to innovate at the same time means a higher likelihood that one or more of the diverse solutions or adaptations to problems in their environment will be successful. Thus, diverse and divergent solutions create niche strategies and give organizations like Visa and the Internet a greater chance for survival as a whole.

**Discontinuous vs. Incremental Change**

The other important aspect of this concurrent, diverse solution or adaptation development process is its tendency to create incremental rather than discontinuous change. For example, a centrally planned product development process defines a problem and then engineers a solution. Specifying in advance all the facets of a problem and then coordinating the development of the solution is efficient if the conditions that impact the

\(^{45}\) From a discussion with Charles Osborn, April 7, 1995.
problem are static. However, when you are trying to design solutions for an ever changing environment, and the problem definition and solution engineering take sufficient time that the problem itself has changed, and the engineered solution no longer solves the problem.

Figure 6.2: Discontinuous vs. Incremental Change

By relying on the diversity of agents to create emergent, incremental solutions, the organization can adjust along with the environment. Planned solutions lock an organization into a trajectory of change that may not fit the unpredictable evolution of the environment in which it "lives." An example of this is apparent in computer hardware. By investing in IBM's engineered solution for computing, that is their mainframe computing environment complete with proprietary software, companies locked themselves into IBM's vision of the future. Those that have invested in more open systems can adopt new software solutions that have been incrementally developed over time by many vendors in many niches. This is an oversimplification, but it does illustrate the difference between a "built" or a "grown" solution.

It is true that "grown" solutions are not perfect or even elegant. Usually they are merely adequate. However, they tend to be applied more quickly than engineered solutions, and with application comes feedback. The feedback serves to refine the problem more and thus enable the production further incremental solutions. Each new "release" solves the problem even more adequately and includes adjustment to new environmental conditions that have arisen in the interim. In this way, incremental solutions can be more effective, if not more efficient, because they allow adaptation to the unpredictable evolution of the environment in which they are applied. These ideas also have been applied to software development; prototypes of software systems are tested with users in order to gain feedback about the fitness of the solution, as well as to gather information about changes
in the environment that have occurred since the last prototype. It is also clear that the Internet follows a similar strategy; each protocol has many releases, or versions, which solve problems that arise out the evolution of other technologies in the system.

Both the Internet and Visa use decentralized forces to develop incremental improvement. Both are solution-driven in that they do not try to engineer solutions, but rather choose among possible solutions developed by their respective "agents." The IETF uses the follows the maxim "we reject kings and concentrate on working code." Similarly, Dee Hock tells of choosing "serviceable technology" over elegant solutions. When deciding on which technology to use to encode information on the Visa card, many technologies superior to the magnetic stripe were available, yet not all countries had the electronic infrastructure in place to make use of them. Thus Visa decided to go with an incremental solution—magnetic strips—rather than embedded chips with the understanding that they would most likely switch to embedded chips at some point in the future.

This decision seems inefficient given that embedded chip technology was already acknowledged as the long term solution. However, it was an effective solution, given that it encouraged the better data communication in the entire system in the short term, lowering transaction costs in the process. In addition, there was time to learn more about how data embedded on the card could be used in the future, and how the ability to do so might impact the desire to do so, changing the trajectory of the embedded chip's development. This topic is illustrated further in the next section where I discuss the use of cooperative and competitive forces.

**Cooperation versus Competition**

The most important forces working in opposition at Visa and the Internet are the forces of cooperation and competition. Both are set up to enable their respective agents to develop both competitive and cooperative strategies as they react to their environments. This ability is important because it allows for the entire entity to develop very effective solutions while at the same time preserving the agents' autonomy and incentives to compete with the same agents with which they cooperate. It is the way these forces work together, the way they both attract and repel the agents, that make the Internet and Visa so successful. These positive and negative forces push and pull the systems together, achieving Hock's desire for minimum order and maximum chaos.

**Prisoner's Dilemma/Tragedy of the Commons**

One way of thinking about the cooperative and competitive forces at work in Visa and the Internet is to identify the Prisoner's Dilemma and the Tragedy of the Commons that face the agents in each organization:

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Visa

Member banks want to cooperate at Visa so that the network of cardholders and merchants is as large as possible, as is the potential for transactions and interest charges earned. However, each bank wants the other banks in its area to fail or be excluded from membership in the Visa card program so that it can have a local monopoly on Visa cards and therefore more cardholders and member institutions. Therefore, the banks have an incentive to compete, but each bank will also be better off if it cooperates.

Member banks can cause a tragedy of the commons by claiming Visa membership and thus getting the advantages of its name, but not abiding by the rules and regulations set forth in the By-Laws which guarantee interoperability and manage the overall brand image of Visa.

Internet

The Prisoner's Dilemma is similar for the Internet. Each network provider wants to cooperate by exchanging bytes because the interoperability of the Internet and access to vast information sources via a singular network is what makes the Internet valuable. However, each wants to gain more of its competitors' subscribers by forcing competitors out of the market.

The tragedy of the commons is that there is a scarce resource in the form of bandwidth. If a network service provider consumes excessive bandwidth on behalf of its customers, then everyone is worse off. There must be joint investment and stewardship to make sure that bandwidth is increased, used more effectively, and/or equitably allocated.

These forces are played against each other in order to keep these organizations together, mainly in the areas of innovation and standard setting cooperative behavior.

Innovation

Within Visa, the member banks are granted the right to innovate around products and services that they offer their customers so long as they conform to the guidelines developed by Visa. Thus, each agent has the power to compete with every other agent, in other words, to develop a competitive strategy as a reaction to its environment. For example, banks teamed up with non-banks to create award programs like the American Airlines bonus Mileage cards, which give Citibank an edge over all other member banks. At the same time, each bank must develop its competitive strategy within the guidelines adopted by the Visa organization as the result of a cooperative strategy. As a result, product development is not coordinated within Visa, but rather the market forces outside Visa, and is a direct analog of agents adopting diverse adaptation in a complex adaptive system. It is a chaotic, haphazard process that is "controlled" only by market feedback and the requirement that the new product interoperates with other products in the system according to standards cooperatively set by other agents—maximum chaos with minimum order.
Conversely, cooperation is used to make product development more robust than it is in nature. Part of the Visa International staff is focused on product management and supported by the funds contributed by all members of the organization. These product managers are concerned with brand-wide product implementation, but they are also sensors to the competitive environment facing Visa as a whole. They can react quickly to threats from MasterCard and American Express, ensuring that the Visa brand as a whole is successful. When American Express offered travel insurance, for example, product managers at Visa could quickly put together a competitive service after it was approved by the regional and International Boards. If the responsibility for product development had been exclusively at the member bank level, the time needed for a solution to emerge might have been dangerous to the Visa brand.

There is product management at the regional and national level as well; here product management watches local products developed to meet unique environmental requirements. For example, certain cultures disapprove of credit, and as a result, debit cards were developed and managed in these regional or national organizations. Thus at each level of the Visa hierarchy, cooperative and competitive forces coordinate product development, and thus simultaneously enable chaotic evolutionary development, efficient solutions to local environments, and orderly cooperative reaction to Visa's competition.

Similarly, Internet service providers have the ability to innovate around products and services they offer their customers. Many service providers are now developing security services to differentiate between themselves and their competitors. Some are developing software that makes using the Internet easier. While their relationship with their customer is unregulated, the information that they put out on the net conforms to the standards set by the IAB. Again, there is chaotic competitive product development in the cooperative behavior that ensures interoperability.

It has been suggested that control is not the power to direct innovation, but rather the power to stop it. IBM and Xerox fund various R&D projects that develop diverse solutions but they rarely let the market give them feedback as to an innovation's worth. Instead, forces inside the company evaluate the worthiness of a product by deciding to take it to the market or to kill it. Countless times, IBM and Xerox have failed to market ideas (like the graphical user interface) on which others have built empires. It seems that Visa's product development strategy, while more inefficient than a centrally planned one in terms of resource allocation and economies of scale, more effectively extracts the value of innovation from the market. Similarly, the Internet lets the user community test the fitness of a new application on the Internet. By not controlling innovation, both the Internet and Visa demonstrate their distributed control.

Centralized, Cooperative Functions

The use of competition and cooperation to coordinate behavior is not only in evidence in product development but also in the centralized cooperative functions. These functions are subject to complacency and inefficiencies because there is no competition forcing

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49 Tom Flanagan, Sloan MOT Candidate, April 21, 1995.
these functional areas to innovate and produce high levels of service. Visa has imposed competitive forces on its cooperative, centralized functions to avoid this problem. While Visa International would like to operate the information technologies at all levels of the regional hierarchy, no member organization at any level is required to use Visa International's service or technology. They have the freedom to buy information systems and management in the marketplace. This both forces the design of decentralized information systems that enable freedom from Visa's central management, and provides Visa's internal organization with the market incentives that encourage innovation and high levels of service.

Currently there is no analog to this arrangement on the Internet since the there is no centralized organization providing centralized services. Instead, the top tier NSPs are actually in competition with each other, providing the same incentives to innovate and provide service. Should a central organization be formed as part of the commercialization of the Internet, these forces should be preserved.

**Hierarchy in the Decentralized Organization**

Another paradox about these successful organizations is that both use hierarchies to manage their decentralized structures. However, the hierarchies are not hierarchies of power, but rather aggregations of agents that actually serve reduce the amount of dependence and coordination between agents. The difference between these decentralized hierarchies and traditional hierarchies are based on the fact that they manage participation and complexity, rather than authority. These hierarchies are closely related to federalist ideas, as are the checks and balances that the hierarchies provide in eliminating undue influence and finding the most efficient consensus decisions. Indeed the hierarchical structure is a means of imposing order on chaos without destroying its benefits; the hierarchy itself is a large cooperative strategy, and is an extremely important feature of these organizations.

**The Fractal Nature of Decentralized Hierarchies**

Because the goal of hierarchies in a decentralized organization is based on managing participation of many agents, they tend to be fractal in nature. That is, the shape and format of each level of the hierarchy are similar, and each level of the hierarchy has a similar relationship to the level above it, as well as having a similar relationship to the one below it. Each also has similar rules governing its behavior and similar authority. There are explicit rules for interactions between organizations that help to coordinate activities (again, standardization serves as the method for managing the usability of information flowing between parts of the hierarchy).

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50 The term fractal refers to things that are similar in shape and structure when aggregated and disaggregated. For example, a graph of the performance of a single stock over the course of a day has a similar appearance and structure to the graph of all stocks over the last 50 years. Similarly, a cell has organelles that serve the same function as the organs of which the cell might be part in a more complex animal.
For example, each level of the geographic hierarchy at Visa has similar powers, and their activities are largely identical. They are responsible for the budget and membership rules of their level of organization. Each has some authority over the group below, and grants some authority to the group above. Visa International in turn grants authority to the lowest level by submitting to the “rule” of a Board made up of member banks. The hierarchy on the Internet is also fractal as the Internet Access Providers look just like the Network Service Providers. In both cases the interactions are standardized. At Visa it is the Board process that forces standardization; on the Internet, the IETF actually standardizes the interaction between the layers, both technically and in the standards setting process.

This fractal structure serves several purposes:

(i) it reduces risks by insulating other subassemblies or agents from the failure of any other one,

(ii) it allows for information to be passed easily between subassemblies or agents since it is highly reusable given the similar structures of the others, and

(iii) it allows the independent entities to be loosely coupled and not overconnected, providing stability.

In essence it replicates the ability for the benefits of interacting agents to exist at each level of the hierarchy, i.e., regional Visa organizations interact like agents with their peers, as do peer NSPs. It also has a tendency to replicate itself when adjacent organizations are formed. For example, the New England Area Research Network (NEARNet) was established in order to put together a network for the New England area to take advantage of all the Internet had to provide.\(^{51}\) Not surprisingly, it was formed with many of the principles of the IETF itself, and included committees for standard setting, etc.

**Efficiency and Effectiveness**

The basis for consensus decisions at both Visa and within the Internet is whether or not the given solution will increase interoperability, and therefore the potential of the overall network, making everyone better off. However, consensus usually means that a solution satisfies the needs of the lowest common denominator and is suboptimal on some level for everyone. The hierarchical structure mitigates this effect by building in local consensus points, pushing consensus decisions down to the lowest level possible. As a problem arises, it works its way up through the hierarchy. If it is a problem that can be handled at the national level in Visa, then the consensus is reached, providing a much better solution since the lowest common denominator within a nation is probably “higher” and less suboptimal than that at an interregional level.

For example, even though magnetic stripe technology was chosen by Visa International, Visa France wanted to implement embedded chip technology because France had the

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infrastructure to support it. As long as it included a magnetic strip, France was able to
add further functionality. By reaching consensus to use the embedded chip within its own
country, Visa France achieved a local consensus that was more efficient in its local
environment than was the global consensus. In other words, the participation of agents is
gathered and coordinated at the appropriate level, diminishing some of the inefficient
effects of cooperative behavior and increasing the overall effectiveness at the same time.

Cycles
The layers of hierarchy serve as "cycles" in Weick's framework. Since Visa is a
conglomeration of many diverse parts subject to some common but often different rules
of behavior, there is a high likelihood that the information coming into the governing
structure will be highly equivocal. Weick predicts that there will be a small number of
rules around processing this information, but a large number of process cycles. In fact,
Visa has precisely such a structure. The By-Laws are explicit about how to process the
information, which is done by a series of many board decision processes, or in Weick's
words, cycles. Hock himself says the process "allowed organized information about
problems to emerge."52

Similarly, the decision making process on the Internet involves the RFC cycle so that the
issues become clearer to all decision makers involved. The comments of Internet users
serve to refine the information with their diverse and varied insights, as reflected in
Kapor's comment about "fresh air" in the system. As with Visa, the IETF standard setting
hierarchy does not aggregate authority, but in the case it does aggregate clarity and
unequivocal information.

Conversely, in both organizations, the structure and nature of the operational information
that is passed between agents (i.e., packets of digital information) is highly unequivocal
and thus there are precise rules about how and when it is passed, just as Weick predicts.
This precision enables the interoperability that both organizations need to be successful.

Influence
The striking thing about Visa and the Internet are the way their structures reduce the
ability of large stakeholders to unduly influence the system. Why isn't Citibank "running
the show" at Visa? As it largest card issuer, one would think it would be in a position of
power. Similarly, MCI and Sprint handle enormous amounts of Internet traffic, yet they
have not had the power to enforce or introduce proprietary standards. This suggests that
something about the structure of both these organizations limits influence.

Indeed, Visa's By-Laws are laid out such that there is fair representation. Voting rights
are based on sales volume, but only to a certain point (see Chapter Five for specifics).
With the Internet, the decision process is so based on meritocracy and there is so much
participation that it would be difficult to force a proprietary standards that did not in fact

52 Dee W. Hock, "Out of Control and Into Order," seminar, MIT, September 27, 1995.

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best solve a particular problem. Thus the large players are kept in line by the power that is distributed to end-users.

Hierarchies as Change Managers

Both Visa and the Internet use tiers or hierarchies as a way to manage differing rates of change. That is as things become more complex, hierarchies are often used as a way to isolate and manage parts of the system that have different dynamics. In computing, we moved to a two-tiered client server model partially because the technology of the user interface is changing at different rates from the data storage technology; by separating the two functions into tiers, the functions gain the ability to change at different rates. Similarly, the core network traffic on the Internet is changing more slowly that the user interface or access is, making a tiered structure efficient.

Visa also uses the hierarchy to manage different regional concerns. For example, the banking industry is changing much more quickly in the U.S. than in Europe, and the regional structure allows that change to occur with much less impact than if Europe and the U.S. had to both adopt new procedures based on the regulatory change in the US.

Evolution and Learning

Knowledge Transfer and Learning

Both Visa and the Internet have forms of knowledge transfer and stored learning that define adaptive systems. In Visa, the Board structure facilitates the spread of important competitive knowledge, as does the market system in which Visa products are placed. For example, a new Visa product is widely advertised, and all other agents learn of it through normal market mechanisms like trade journals and industry reports. Information about coordination activities is spread by the board process.

In the Internet, the Internet itself is the method of spreading knowledge. The whole RFC process is one that spreads information and learning, and once a standard is defined, its specifications are published on the Internet as a record for all those who need access to it.

Another requirement of an adaptive system is that learning must be preserved. When Visa somehow adapts to better fit its environment, that may mean that the structure of the organization changes. For example, a new region is being created due to the changes in Eastern Europe. In a sense, the changes to the By-Laws serve to preserve learning the way the specification and publishing of standards does on the Internet.

Changing the By-Laws at Visa serves another important function. One of the major tenets of Peter Senge's views on organizational learning is that structure influences behavior. He says, "when placed in the same system, people, however different, tend to produce similar results." Therefore Visa's ability to change its structure literally serves to adapt and change behavior, enabling the organization to evolve along with its environment. One question that surfaces at this point is that organizing along geographic

lines might not be the best format in the future given that geographic boundaries are becoming seemingly less important. It may well be that the banks would rather be organized on a different dimension. The By-Laws specifically state powers in terms of geography, but the By-Laws also have rules about how the By-Laws can be changed. It is theoretically possible the Visa could even evolve into an organization based on a completely different hierarchy if it were willing to change the By-Laws to reflect that new dimension along which the hierarchy would be organized.

Since these learning mechanisms allow adaptation to occur, they also allow both the Internet and Visa to evolve along an unpredictable evolutionary path.

**Federalism and Decentralized Organizations**

Complexity theory provides a powerful lens through which to view these two organizations, but there is a political lens which is just as appropriate a framework by which these two organizations can be understood. Federalism, which provides for autonomy and cooperation, is an equally powerful lens through which to examine these organizations. In fact Charles Handy, a London Business School professor who believes that federalism must be an important part of organizational design in the future, talks of subsidiarity, a directly analogous concept to both subassemblies and agents. Federalism, in so far as it uses hierarchy to manage participation, also seems to be a cooperative strategy adopted by "subsidiaries," "subassemblies," or "agents" collectively to manage competitive and cooperative behavior.

Federalism is based on shared authority between a central governing body and its constituent parts which give up some of their sovereignty in exchange for the benefits of cooperative behavior; the constituent parts agree to abide by certain principles and the role of the governing structure is simply to mediate in matters of dispute and to act as a steward of the common good. In Dee Hock's words, the role of the federal government is to manage the conditions of the system, but not necessarily the behavior. It is not hard to see how federalism relates directly to both Visa and the Internet.

**Purpose and Principles**

Federalism does not concern itself with procedures as much as it does with meta-rules, or rules about how to make rules. The U.S. Constitution is a prime example of this. It states the principles by which citizens agree to live together and gives instructions about how rules or laws will be made, but it does not in general specify the laws themselves. That is left to the legislators, while the fit between the laws and the Constitution is judged by the Supreme Court. The purpose of the government is to provide conditions under which states can cooperate and through which the interactions between states can be equitably and fairly defined. It tries to do so with the knowledge that a federal government cannot possibly predict all the issues that will arise, so it has procedures that help define and solve problems.

Interestingly Thomas Jefferson, one of the most famous Federalists, was also a firm believer in innovation. The father of the U.S. patent laws, Jefferson believed firmly that individuals or agents, should be able to innovate and retain the fruits of their innovations.
regardless of the fact that an innovation is a public good, and may be subject to the stewardship of the government. Both the Internet and Visa also allow their respective agents to retain whatever benefits they can capture as a result of their innovations.

As in the U.S. Federal system, checks and balances are built into Visa in terms of the voting rights of members and the specification of who has the right to make decisions. Additionally the members themselves sit on a board at the top of the organization, performing somewhat the same role as the Supreme Court. In the Internet, the checks and balances thus far have been the high visibility of the issues being uncovered, but there is concern over how long that can and will continue to be sufficient.

Shared Values

One of the key aspects of a well planned federalist system is that values need to be well aligned. Indeed, most difficulties arise when different agents have different objectives. However, business might well be an easier environment in which to implement federalism because in general it is easier to define shared values around a certain goal—that is, shared values are less subject to emotional or moral inspection in the business world. While Federalism in government seems sensible, it is rarely easy to implement because of differing political beliefs. However, in business there is usually an overriding goal to which people have subscribed by virtue of choosing to work for the company trying to implement a Federalist structure. That is, if you accept employment or membership at Visa, you have implicitly accepted the stated purpose of "enabling the exchange of electronic value." Similarly, the community on the Internet has thus far been homogenous and well aligned in their values.

With respect to values, federalism does not try to define how those values are to be manifested in behavior. Dee Hock proffered the example that one could never write a manual on how not to steal, yet we can all agree that stealing is wrong. He also offered the insight that it is the simple rules that are easy to write down, while the intangible, unmeasurable things that often mean the success or failure of a company are not. Why try to codify these things? Hock feels that such effort would be better spent on providing a platform where good ideas can take shape and be executed without being impeded by rules and procedures.

Self-Policing Behavior

The other benefit of decentralized authority is that it causes self-policing behavior. When people have power and authority, they are unlikely to give it up. In general U.S. citizens will react violently when they feel their power is being usurped by the government. Witness the fight over abortion rights, and the violent behavior of those who feel their rights are being violated.

In Visa, member banks acted as policemen when early in Visa history, in order to facilitate the rapid acceptance of Visa cards by retailers, Dee Hock made a special agreement with J.C. Penney to accept Visa cards. Hock allowed J.C. Penney to connect directly into the Visa system without going through a bank. The member banks violently reacted to Hock's move because they knew that one of their rights had been violated: Visa
had gone into competition with banks in a sense, cutting them out of the transaction fees from Penney's. The result was an explicit By-Law making such future agreements "illegal."

Similarly, Internet users who share the value that invasive advertising has no place on the Internet, have literally kicked those who violate this tenet off the Net. Violators are either inundated with hate mail, or complaints are sent to their network provider until the provider is forced to discontinue service.

**Power to the End-user**

It is interesting that by leaving power, control and authority at the periphery of the Internet and Visa, the end-user has acquired the most power. For example, the purpose of the Internet is to exchange information, and the end-user has the ability to access vast amounts of information and construct it however she wants. She can put together random bits of information to make a decision about what country to visit, or she can use it to formulate her own political views. She can also use it to broadcast those views to millions of people at almost no cost, no matter how esoteric her ideas or how small and widely dispersed her audience might be. The point is that she decides what her "product" is by virtue of being a consumer and a producer and purchasing access to the Internet. Similarly, the proliferation of options in the credit card business means that cardholders can choose whichever card product gives them the options they want, whether award programs, low interest rates, or high credit limits. They may complain about getting so many card offers in the mail, but they nonetheless have great power in the market place.

**Other Common Elements of these Decentralized Structures**

**Technology Mirrors Decentralized Structure**

As previously mentioned, in both cases the technology underlying these organizations mirrors the decentralized nature of the governance structure. This is an important feature of these organizations. In Visa, the information systems are decentralized as a result of the regions' right to chose a supplier for these services. In the Internet the systems are decentralized so that they are invulnerable to sabotage or national disaster. This is another example of how structure determines behavior, but a full explanation of this phenomenon is beyond the scope of this thesis. See also the research of Kim Clark at the Hard Business School. I will however touch upon the use of information technology in coordinating large organizations in Chapter Eight.

**Importance of Individuals**

In both organizations, strong individuals have been germane to the development of governing structures. Visa would not have happened has it not been for Dee Hock and his incredible ability to influence the key people involved in the process. He was involved in every decision in the beginning, and one could construe Visa as a dictatorship in those days rather than a decentralized organization. Nonetheless, his legacy is one of distributed control and authority.
On the Internet, the key technologists who built the network have remained committed to its openness and ubiquity. Their selflessness has contributed to its growth and interoperability and the importance of their contributions cannot be overestimated. Without these key people, it is hard to know whether these organizations would have evolved in quite the same way.

**Meritocracy**

The importance of the meritocratic nature of both organizations cannot be overlooked. The Internet gives people the ability to express themselves on any issue they want. Through that recorded and widely dispersed expression, people gain influence and respect. Those that are especially well respected will most likely eventually serve in some way on one of the governing entities of the Internet. This system works well because when it comes to reaching consensus, the people who reach the top are likely to be those that have good judgment, shared values, and the influence to build consensus, making the consensus process as efficient as possible.

In Visa, there might be more self-interest in play from each board member because, after all, he or she is representing the interests of a multi-billion dollar institution. However, the election process of the board also ensures that the people who reach the top are those that are most respected and who have shown their ability to act for the common good, and the decisions made by these people are likely to be the decisions that are in the best interest of the group as a whole.

**Motivations**

In both cases, the motivation for participating in the formation of these groups seems to have a great deal to do with the overall vision of each organization. People at Visa mentioned how excited they were to be working on an idea that they knew would change the world. They also mentioned that in the beginning that they took pay cuts to come to Visa because they believed in Dee Hock's vision and because it was all so new. Similarly, those involved with the development of the Internet over the past few years are excited by its potential, and leery of those who would make it into "just another radio or television." The sense that the purpose of both organizations was something that would have major impact on the world seems to be an important part of the process, whereas money seems to have been largely absent as a motivation in either organization.

**Measuring Success**

Another interesting characteristic that both organizations share is that they lack well defined measurements of success. Visa measures the volume of money going through its system as a percentage of the total "personal consumption expenditures" and the number of transactions. However, because banks have the power and responsibility to sign up cardholders, the staff at Visa International really has no direct control over how much volume Visa does. What then is the criteria for Visa International or a Visa staff member having done a good job? Hock purposefully implemented an explicitly subjective review process at Visa that did not rely on any quantitative measurement; he sanctioned what he called a "godfather bonus" which a manager could give out to an employee at anytime for
any reason. Hock said his goal was to make employees financially independent so that they would feel comfortable disagreeing with management any time they felt there was sufficient reason. He was not interested in the quantifiable aspects of their performance, but rather the quality of their work.

Interestingly, one of the first things that Ms. Rossi of Wells Fargo Bank mentioned as a frustration in having worked with Visa was that “they never measure anything!” Scott Lofterness also mentioned how ethereal measurements of success are at Visa. Clearly not everyone is comfortable with the lack of measurement, and clearly not every function in Visa International is unmeasurable. Yet because its success is defined by interoperability and brand recognition, which are both difficult to measure, some degree of subjective judgment seems inherent in evaluating Visa.

What is success on the Internet? Right now an individual's success is driven by his judgment he exhibits or the quality of the solution he devises. In many cases he gets no compensation for solutions, only the satisfaction of knowing he has somehow made the Internet better, and that his solution was better than others proposed. The success of the Internet overall is more based on interoperability, and quality of access, both of which are difficult to measure. However, when one has contributed to either, it is apparent. For example, Marc Andreessen, the developer of Mosaic, received no compensation for developing that tool. Nonetheless, the impact of his "solution" on the Internet's success is vast, and its graphical nature has made the Internet dramatically less arcane, improving the quality of access. His contribution will gain him the role of a steward in the future—when he has an opinion on a new standard, others will listen to him by virtue of past achievements.

Perhaps the most telling thing is that both Visa and Internet are tremendously valuable entities, yet neither one has any value on the traditional market. Wall Street would not know how to value either if it tried. Both are simply a collection of hardware and consensus mechanisms which add far more than the sum of their parts, yet cannot be valued using any traditional measures. In distributing responsibility and power, Visa and the Internet have also distributed investment; one of the reasons Visa is hard to value is because the capital and labor that make it a success are distributed at the member bank level, and are not under the ownership or employ of Visa International, while the major investment in the Internet is in the end-users' hardware.

Accountability

A very interesting aspect of both systems is the way they deal with accountability and responsibility, both legally and otherwise. By leaving the interface with the end-users solely at the bank level, Visa isolates a great deal of the customer service accountability there as well. For example, if a cardholder detects an error on her statement (which is produced by the issuing bank, not Visa), the cardholder expects the bank to straighten out


the situation, and in fact the bank has the responsibility to do so. If the error is made within the Visa system, Visa is liable to the bank, but the cardholder is unaware of any restitution on Visa’s part. There is an arbitration process within the By-Laws, but there is also explicit lack of indemnification on Visa International's part and an explicit delegation of legal responsibility.

One of the big issues on the Internet today is that there is a similar delegation of responsibility to the point that no one is in control at all. If Wells Fargo Bank initiates home banking on the Internet for example, and there is a serious error made in transition, Wells Fargo will be liable for the error in the customer’s mind and probably in the customer’s account. However, Wells Fargo has no control over transmission over the Internet, nor does it even have the ability to trace where and how the error may have occurred because the Internet is designed to make routing transparent and dynamic. Until the Internet became the object of commercial attention, accountability was never an issue. Now that there is more at stake, reliability and accountability are key risk factors for those wanting to use the Internet to exchange value as well as information. How issues of accountability will effect the Internet remains to be seen, but since there is no mechanism to build trust, and ensure reliability, this lack of accountability will be a major disincentive to further commercial development, and seems to be creating pressures to centralize accountability and hence control of the Internet.

**Level of Analysis**

Finally, the fractal nature of the design of these organizations seems to obscure the issue of the level of analysis. As stated in the beginning of this chapter, it is hard to know just how to define which level in each organization should appropriately be labeled an agent. After all, it is the individual users on the Internet that come up with diverse software solutions, not the network service providers.

Similarly, one hesitates to omit the end-users of Visa's system as agents as well since their actions impact Visa's behavior. The opposite problem is also in effect. Visa is an organization whose product is coordinating many agents. However, it is itself an agent when seen in the context of the whole credit card industry. It competes with Mastercard and American Express, yet the phone devices that authorize charges at the merchant’s site service all cards, indicating that Visa coordinates with its competitors at some level, just as it enables member banks to do.

Finally, one can look at the underlying technology of both organizations as a metaphor for decentralization and coordination. I do not believe that it is a coincidence that both organizations have this ambiguity with respect to what level of analysis is appropriate, but rather it is a feature common to truly decentralized organizations.

**Why did Visa and the Internet succeed where so many have not?**

Many organizations have tried to become more decentralized with varying results. What was it about Visa and the Internet that gave them a greater chance of success?
I believe that the issue of accountability comes into play most prominently here. In both cases, organizations were evolving for which there was no legal precedence. This meant that the organizations were free to evolve without the encumbrances of regulation or product liability law which make "clean sheet design" so difficult in many other industries. In fact, one Visa employee talked about how exciting it was to be at Visa because they were breaking new jurisprudence ground everyday.56

The other key factor is that, as previously mentioned, the information technology underlying the organizations has been a powerful influence. Both organizations were involved in developing decentralized logical networks built to enable many-to-many communication. With that type of goal at the heart of the organization, it may well be easier to remain decentralized—again, structure influences behavior.

There were other factors that made these two organizations prevail against our tendency toward centralized command and control. To say that it was simply one or two factors that led to their success would be antithetical to what complexity theory espouses. However, both these features had a significant impact on their successful decentralization.

**Visa and Internet: Not an Identity**

While there are startling similarities between these two organizations, there are some salient differences as well. Visa has a mechanism in place that manages the issues around interoperability as well as the competitive forces at work within Visa. The Internet has only a body that manages interoperability, the IETF. Up until now, the Internet has been entirely emergent: it was a "pull" system in that there was no one actively pushing solutions via the Internet for economic gain, but instead solutions were "pulied" into existence when problems arose. There was little money to be made on the Internet, and thus the only activities that needed to be managed were cooperative in nature.

Whereas the Internet was a pull system, Visa has always been a "push" system. At Visa there are forces that cause competitors to push new solutions on to the market in order to gain more customers, usually from other competing member institutions. Thus Visa always has had the need for a governing structure that monitored competition. After comparing these two organizations, I believe that the Internet soon will have to develop its own central structure to coordinate the competitive behavior of network service providers and other levels of agents and to coordinate the investment necessary to avoid the tragedy of the Internet's commons: bandwidth. Already there has been fragmentation on this dimension, as just this month the National Science Foundation has declared that the Internet has become so crowded and slow that the NSF will pay for a special high speed TCP/IP network dedicated to the supercomputers at all NSF research locations. This special high speed line will guarantee a certain speed of service, but it is also an example of the forces pushing the Internet toward proprietary solutions.

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If a central group does not develop, the government will come in to regulate it just as it has with the broadcast media. The Internet has the choice—develop a coordinating body or have the government do it for them. The analysis of Visa seems to suggest that if the major players were thinking strategically, they would enlist the help of visionaries, and do it themselves before the government has its chance.

A coordinated group of network service providers may not be enough. That group may well be a subgroup in a larger organization that coordinates between other stakeholders such as major content providers, telephony, and retailers, or the logical layers of the Internet’s hierarchy. How that body might be designed is addressed in Chapter Eight below.
CHAPTER SEVEN
COMMON PROCESS ELEMENTS OF THE INTERNET
AND VISACOMMUNITY INTERNATIONAL

One of the goals of this particular project was to consider whether these two entities, the Internet and Visa, were in fact similar enough to be considered specializations of a single generic process. Through work with Tor Ramsøy, Charles Osborn, and Thomas Malone, we have indeed determined that these two organizations can be thought of as specializations of a certain type of organization, an exchange network.

In attempting to develop the general case for “Govern Exchange Network,” I started from my knowledge of Visa’s governance process. In particular, I have attempted to describe what Visa does in the most abstract terms since functional process maps of Visa’s operations have already been diagrammed as part of a previous analysis of Visa’s operations.57 From the analysis in the preceding chapter, I have concluded that the main function of Visa International and its board structure is to facilitate cooperative behavior while facilitating beneficial competitive behavior. These two processes both manage important shared resource dependencies involved in funding cooperative projects as well as the usability dependency involved in the flow of both highly structured information (e.g., transactional data) and highly unstructured, equivocal information (i.e., issues that result from competitive behavior between the member institutions and in the credit card marketplace in general) between entities in the Visa organization. Figure 7.1 illustrates these dependencies.

In other process mapping methodologies, the only process one could map would be the board process, a simple approval process. However, I found that by doing the type of dependency analysis prescribed by the Process handbook, I have come closer to determining the true essence of how Visa accomplishes the coordination of hundreds of thousands of organizations and millions of people. While another researcher might draw a different diagram, it is the exercise of identifying the key resources and the mechanisms for coordinating the corresponding dependencies that reveals important subtleties that I believe would remain hidden if simple flow chart methods were being used.

Using Visa as a starting point, I tried to determine whether there was a specialization of the "Run Visa Card Program" diagram that might similarly describe the Internet's governance process. The Internet has developed over the last 25 years with little attention from the commercial marketplace. As a result, the primary concern of its self-appointed governing bodies has been to facilitate cooperation between disparate users so that interoperability and reliability may be maintained. Therefore, the decomposition of "Run Internet" consists only of "Facilitate Efficient Cooperation."
Conversely, Visa has always been a system in which competition played an extremely important role; therefore, it includes the subprocess "Facilitate Beneficial Competition." While there is competition on the Internet, it is not part of the IAB's or the IETF's responsibility to manage it. This difference does not, however, mean that there is not a supertype of "Run Federal Exchange Network." Our vision of the specialization hierarchy appears below.  

This analysis invites one to apply these ideas to other forms of exchange networks. Tor Ramsoy has analyzed AT&T's telecommunications network, which is completely

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58 Developed by Thomas Malone, Tor Ramsoy, and Emily Breuner.
centralized, regulated, and monopolistic. In thinking about this decomposition, it seems that there is little, if any, similarity between AT&T and these other organizational forms. If anything, the "Run AT&T" decomposition would look like a specialization of a conventional "Run Business" decomposition with typical product development and supply chain management processes. Whereas the other specializations' decompositions seem to show pure coordination of key resources, AT&T's is so different that I question whether it can truly be called a specialization of "Run Exchange Network."

At the other extreme, one can think about any marketplace as an exchange network. Some markets are regulated via price supports or government intervention (as had been the case with the telecommunications industry until recently), and others are largely deregulated, such as the open systems market now apparent in the high technology industry. In this industry, there are hundreds of legal or ad hoc joint ventures between companies who are also competing with each other (e.g., Apple and Microsoft software for the Macintosh versus Apple and Microsoft Windows). Thus, the "Facilitate Cooperation" function is coordinated, but again, the competitive aspects are uncoordinated (except by the market).

![Diagram](Image)

**Figure 7.4: Run Decentralized Network**

Thus, it seems there are many similarities between the various decentralized exchange networks. However, the centralized network seems so different that it does not seem to fit under this specialization tree, but rather under a more traditional "Run Business Specialization." Nonetheless, by analyzing these examples in terms of the key resources being managed, these important differences have been brought to light. The Process Handbook thus seems to tease out important characteristics of coordination processes that other process mapping methods leave undetected and thus unmanaged.
The Application of Information Technology to Coordination

Third Order Effect

One of the goals of coordination science is to examine the way in which information technology can impact coordination within organizations. Looking at how information technology has been used within Visa, we can see that indeed Malone and Rockart's third order effect has been realized. Neither entity would be possible were it not for the astounding advances in information technology. However, they have not used information technology to more tightly coordinate different organizations, but rather they have used information technology to loosely coordinate many organizations; both entities are designed such that the amount of coordination between subassemblies in the structure is minimal, but the number of subassemblies that are able to coordinate with each other is astounding.

What are the implications here for the design of collaborative applications? There is a tendency to try to design applications that will allow us to control more parameters of a system or systems. In complexity theory terms, however, this causes organizations to become "overconnected" in that they tie themselves too closely to the fates of other organizations, and spend precious time trying hopelessly to reconcile many changing parameters across the organizations.

In one sense, material requirements planning (MRP) applications are an example of this problem. MRP systems are elaborate systems in which all parts of a manufacturing process are modeled and then used to predict and manage the flow of materials through the manufacturing process. They require tremendous investment, but their value has been questioned because they are so difficult to maintain and there are so many variables to identify and track in the systems. Conversely the kanban "pull" system, in which each process sends a message only to the one directly before it when materials are needed, is incredibly simple and is based on small amounts of standard information passing between local, separate processes. Until recently we have seen only the second order effect of the use of IT in coordination, as IT has been used to automate and increase the amount of coordination information flowing in a system, as in MRP.

On the other hand, Visa and the Internet seem to be displaying the third order effect of the use of IT in coordinating organizations. Rather than using IT to try to control more and more coordination parameters within these two organizations, they both use IT only to pass large amounts of transactional data between the "subassemblies" of the system, more like kanban systems. Nonetheless, they have succeeded in coordinating the behavior of thousands of institutions and millions of people. It may be that the third order effect
predicted by Malone and Rockart is not simply more coordination-intensive organizations, but organizations that require a small amount of coordination on a scale never before possible.

**Collaborative Applications**

How can IT help disambiguate information and mitigate the "inefficient" consensus process? Collaborative applications that can speed up Weick's "cycles" that help clarify the issues might add significantly to better inter- and intra-organizational coordination. Video conferencing and electronic whiteboards will no doubt speed up the board cycle at Visa because it will cut down on travel and the need to have a set meeting schedule. Similarly, I assume that the six month to two year RFC process exists to make sure that every person affected by a proposed standard has a chance to "hear" about a standard under consideration and make comments. "Knowbots" or intelligent agents that can be programmed to alert people to issues of interest might also cut down on cycle time on the Internet, potentially shortening the RFC window. In these organizations where reduced transaction costs have already been realized, the best application of IT will be the one that gives the ability to manage this usability dependency, that is, make equivocal information usable.

**Designing the Decentralized Organization**

The Internet and Visa International have both succeeded in distributing authority, responsibility, and control. I have analyzed the key characteristics that have enabled each to succeed. How can these ideas be applied to the design or redesign of other organizations? The following is by no means a recipe for success. However, the astonishing similarities between the Internet and Visa suggest that some of the following are indeed requirements of a successfully decentralized organizational structure.

**Purpose**

It is important to define a broad purpose for which the organization exists in the first place. Most people would say that their organization has a mission statement and leave it at that. However, the purpose needs to be more abstract than most mission statements, leaving room for the organization to as innovations and adaptations move it in different directions. Most mission statements are too narrowly defined, and do not leave room for evolution.

**Bottom-Up Design**

It is clear from both examples that the emphasis of each organization is on what Weick calls the subassembly, or what Handy calls subsidiarity. Neither organization was designed from the perspective of a central control point that delegates power and authority outward, but rather as separate autonomous units which are increasingly aggregated until there is a collection of cooperative activity at the top. Therefore, any decentralized organizational design effort should take a bottom-up approach in order to achieve success.
In particular, one should use Weick's ideas of subassemblies to try to find the naturally stable unit in the organization being designed, and then identify these subassemblies' "Prisoner's Dilemma." That is, careful conceptual analysis should be done to identify all the motivations for competing, and all the motivations for cooperating. Once the incentive to cooperate are defined, the subassemblies "Tragedy of the Commons" must similarly be identified.

Once these things are understood, a set of operating principles should be created that both preserve beneficial competition while setting up a structure that facilitates cooperative behavior. The principles will evolve into rules which prevent the subassemblies from either acting in self-interest or preservation, or from taking advantage of scarce resources.

**The Role of Hierarchy**

As we have seen in both the Internet and Visa, successful decentralized organizations are not without hierarchy, and the next stage of design would be to design a hierarchy of subassemblies that foster fair competition and cooperation. The hierarchy serves to aggregate subassemblies so that they can cooperate at a mid-level, mitigating some of the inefficiencies of consensus decisions made at the highest level of the hierarchical structure. The hierarchy nonetheless should have fractal properties in that each level should mimic the structure of the ones above and below. This facilitates the development of solutions at a level that is closest to the problem and allows different, locally optimal solutions to be implemented across the same level of the hierarchy. This fractal structure is also important in reducing risk and increasing adaptability to subassemblies' and assemblies' unique contexts.

Another role of the hierarchy should be to enable enough of Weick's "cycles" so that problems and solutions under consideration by the organization are clarified to the point that consensus can be reached. The mechanisms for moving information up and down the hierarchy of assemblies and subassemblies should be designed to achieve this clarification explicitly, and meta-rules allowing the hierarchy to adjust to evolutionary adaptations must be defined as well.

**Managing Inefficiency**

Inefficiency is inherent in cooperative behavior because each subassembly gives up some optimal solution in favor of a common one. However, as Visa has done, competitive situations can be used to manage those inefficiencies, just as Visa manages its central IT organization by making its services optional for the subregions. Therefore, anywhere there are cooperative inefficiencies, competitive forces can be used to mitigate the drawbacks of consensual, cooperative behavior.

**Innovation/Competition**

The responsibility for product, service, and/or process innovation should lie mainly at the subassembly level, but there should be opportunity and incentives at each assembly level as well (e.g., group members may license their product ideas to the rest of the Visa organization). The hierarchy should be structured to reduce the risk of chaotic innovation
that might potentially hurt the organization as a whole. Visa is set up this way in that the failure of a product at the bank level may ruin the bank, but will leave Visa largely undamaged. In addition, this structure increases the chance of finding good solutions because of the number and diversity of subassemblies innovating along the same lines. In essence this structure uses market feedback to "coordinate" product development, and also avoids having a central organization that tries to "engineer" a solution instead of letting optimal solutions or innovations emerge at the local level.

**Shared Resource Management/Coordination**

Conversely, with respects to processes that deal with coordinating the use of shared resources, market feedback has less of a role, and some form of peer review should be used to determine what actors, rules, and behavior best reflect the cooperative aspects of the organization. Federalism teaches us that the focus in the design should be to define the interfaces between cooperating entities, not the operations within them.

**Infrastructure**

Another key lesson gleaned from the Internet and Visa is that the information infrastructure should mirror the structure of the organization. Designing a decentralized organization and then trying to support it with a centralized "nerve center" information architecture will undermine the success of the design.

**Running the Decentralized Organization**

**Stewardship**

The role of the people at the top of the aggregation of subassemblies is dramatically different than that of the people at the top of a traditional hierarchy. The people at the top are stewards, judging the merit of issues and solutions against the purpose and guiding principles of the organization. They do not create "vision," but rather exercise judgment in evaluating solutions that have emerged from various parts of the organization. They are managing the conditions through which growth can occur, not managing operations. Therefore, the people chosen for the top of the organization must have very different skills and motivations than have traditionally been ascribed to board members and executives, and only people with this level of understanding should be chosen to fill these roles.

**Measurement**

As the organization evolves, so must the things measured as well as the way they are measured. Traditional "yardsticks" of success won't apply in a decentralized organization as we have seen in the Internet and Visa. Measurement might well be very subjective. However, people seem to need standards by which to compare themselves, so the results that are measured need to be chosen carefully so that the incentives are in line with the purpose of the organization.
Meritocracy

It bears repeating that the meritocratic nature of the Internet and Visa are key components of the overall success of these organizations. Reaching the top of any part of the hierarchy requires good judgment and understanding of the mechanisms that make the organization work. It is important to support the self-policing, self-governing nature of the decentralized structure by having peer reviews in the form of "elected" and appointed executives and board members, whose behavior can easily be reviewed by peers.

Accountability

Finally, a key intra- and inter-organizational force is accountability. Therefore, as the power and authority is distributed, so must the accountability and responsibility be. This applies to legal as well as moral responsibility. The implications of accountability for contracting issues and legal demands are enormous, and it is no accident that these two successfully decentralized organizations both came into being in areas where the law was largely non-existent. Decentralizing authority without also decentralizing accountability will lead to failure.
CHAPTER NINE
AREAS FOR FURTHER STUDY

Not surprisingly, the data collected in this project raises as many questions as it answers. I am satisfied that these two organizations can serve as prototypes for future organizational design, but further research needs to be done in order to find out how best to apply this analysis to other organizational contexts. Some ideas for further research appear below.

Larger Sample Size

The similarities between Internet and Visa are so striking that it is easy to draw conclusions and forget that the sample size is only two. The next step of this research would be to use the preceding analysis to look at other organizations to determine how valid these conclusions are in other situations. Specifically, it would be interesting to look at both successful and unsuccessful cooperative, decentralized structures to see how well the analysis predicts the outcomes and explains the context of each. In addition, it is important to test these ideas in organizations that are not formal exchange infrastructures like both the Internet and Visa. Some ideas:

Proctor and Gamble

With its competing product divisions, Proctor and Gamble would be an interesting organization to examine. The responsibility for innovation is certainly decentralized, but the structure of cooperative activities is less clear.

Pharmaceuticals

In a recent article in the Harvard Business Review, Rebecca Henderson of the Sloan School presented findings regarding the research and development functions of pharmaceutical companies. These companies also have “federated” product development groups as well as “dictatorships,” and some application of this analysis to her research seems in order. In the companies she studied, a shared resource dependency of corporate funding seems to act as the coordination mechanism much as the market does for product innovation in Visa. Comparing her data to these findings might provide some refinements to my observations.

The American Airlines Reservation System

Some years ago, hotels, car rental agencies and other entities entered a joint venture with American Airlines to try to develop a generic reservation system. After years and millions of dollars, the project was abandoned in failure. Could this analysis be useful in understanding why?

UNIX Vendors

This analysis should be used to examine the various UNIX operating system vendors. Working together, they could cooperatively develop standards for the UNIX operating system that would elevate UNIX's interoperability and appeal due to positive network externalities. They have, however, been largely unsuccessful. Why, and what course of action would this analysis recommend?

Semco

Ricardo Semler has written a series of articles for the Harvard Business Review about the way he has changed Semco, a large Brazilian conglomerate, into a decentralized organization. Gaining entry into his organization to test this analysis would be an interesting project. This company makes everything from plastics to jet fuel, so they must have come up against the product liability issues. Analysis of how they have dealt with accountability would be valuable.60

Bearings

Might Bearings still be around today if they had organized with fractal principles in mind? Would they have been able to structure the company in such a way to manage the risk that one trader could bankrupt the company? As part of the structured thesis project, Sunny Youn has examined risk management in financial institutions and her work should be related to this analysis.61

The Shopping Mall

Every shopping mall in the US is an example of this same structure. Competing retailers come together in one mall because together they draw more customers than they do when they are spread apart across a geographic area. How are joint decisions among retailers made and what constraints are built into mall "membership?"

The University

Universities are another good example of an organizational structure that embodies cooperation and competition. Different academic departments within a university share resources and reputation, yet they compete for grants and recognition as well. Examining these institutions in light of this analysis might reveal further insights.


The Silicon Valley Model

In their article "How Architecture Wins Technology Wars," Morris and Ferguson talk about the Silicon Valley Model of doing business. Many of their observations about how open systems companies do business have parallels in this thesis. How well would analysis developed in this thesis apply to greater industry structures in which cooperation and competition (some call it coopetition) are the norm? They identify the following characteristics of the Silicon Valley business model:

- Organizations' architecture and decision making authority mirror technical architecture
- Meritocracy and Feedback
- Clean Boundaries, internally and externally
- Internal proprietary control of architecture and critical implementations, externalized commodities and niches
- Migration and Evolution over time

The similarities indicate that perhaps the Silicon Valley Model should be analyzed as a complex adaptive system that has already evolved to deal with the rapidly changing information age.

Level of Analysis

Another important feature of my analysis is that it has taken a "black box" view of both organizations; that is, I have looked at these organizations from the outside in without regard for the internal dynamics and how they might impact the success of the decentralized structure. There are many dynamics going in within Visa and the Internet that I have not had time to explore due to the scope of the project. For example, what are the power and political structures like in the Internet or at Visa? How are the various Visa corporations run and how are their organizations impacted by the decentralization of power? Hock suggested that if each regional Visa organization were analyzed, one would find very different views of Visa, and this research should be done. Also, how does one engender loyalty and commitment to the common good within these agent organizations? How far down in these agent organizations must the shared values be understood in order to have the system function? If lessons are to be taken away from these two examples and applied toward the design of future organizations, these things need to be better understood.

Similarly, on a more macro level, it is important to consider what happens when a cooperative entity comes into conflict with another cooperative entity. In a sense this is happening right now on the Internet. New commercial entities are becoming part of the Internet's environment, and their values and purpose might be very different than those of

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the current agents'. How does the organization as an agent adapt to these new conditions? Do the same rules for sharing authority apply in these new conditions? These questions are beyond the scope of this thesis but must be explored if the analysis is to be useful.

**Teaching Decentralized Thinking**

It is easy to look at these two organizations, "get religion," and commit oneself toward decentralization. However, Westerners are not trained to look at the world as though there is no central authority. In fact, many would look at Visa International and argue that indeed it is the central command and control center of the card program. That view may be true at the tactical level, but the essence of the organization is far different. Thus, teaching tools that help people break out of long ingrained centralized thinking need to be developed that will engender an intuitive understanding of decentralization. Michel Resnick of the MIT Media Lab is working on just such applications, and any way in which they can be extended to illustrate how business situation can best be coordinated in a decentralized manner would be of great importance to training organizational architects of the future.

**Dimensions of the Hierarchy**

Previously I hinted that Visa has chosen to organize itself based on a geographic dimension. The Internet organizes its working groups based on the technology underlying the solutions under consideration. What possible heuristics might be determined for how to choose what dimension on which to base one's hierarchy is still unclear with this small sample size. I suspect the answer is very much linked to the important expertise (technological knowledge on the Internet) or the key limiting factors (local regulation and cultural attitudes). If I am correct in applying Weick's "cycles" and concluding that a key function of the hierarchy structure is to "unequivocate" information, then it seems that the structure of the hierarchy should be based on expertise or local knowledge that achieves this. However, I think further analysis of this concept in other industries is essential.

It is my hope that other may choose to extend the work begun in this thesis. I have had the sense in working on this project that all of these concepts will be central to society's leap into the information age, but I feel that I have only been able to expose the top crystal of the tip of the iceberg. Hopefully this work will not end here.
CHAPTER TEN
CONCLUSION

While decentralization is not a new concept, the art of structuring organizations such that they both garner the benefits of decentralization and maintain order is little understood. The success of the Internet and Visa shows that it is possible both to coordinate large groups of people and to create large organizations that are capable of meeting the challenges of the changing environment. By examining these two organizations using coordination and complexity theory, I have tried to identify some of the key forces at work in these organization so that they can be used in the construction of corporations of the future—corporations that can use information technology and organizational design to meet the challenges of the accelerated pace of change that is a driving dynamic in today's business world.

Both Visa and the Internet have evolved to meet the changing environments in which they "live." They use the natural tendency of adaptive systems to develop disparate yet effective incremental solutions rather than trying to centrally plan and engineer them. At the same time, they have enabled cooperation among thousands of organizations and millions of people. Both have done it by structuring the organization to use the uncertainty of the future to its own advantage.

At the heart of both organizations there seems to be multiple paradoxes and ideas that are opposite of traditional organization design; cooperation and competition together help achieve results; information is centralized, yet power is decentralized; hierarchy is not used to concentrate authority, but to manage participation of autonomous agents; management does not solve problems but rather chooses among solutions; the role of those at the top of the hierarchy is not to lead with "vision," but to enable via careful stewardship. Obviously these ideas need to be tested in other organizations and situations to see if they hold true beyond this sample size of two. However, if they do, questions arise about the ability of individuals to evolve into this new management style. What kind of person will be the CEO of a corporation when power is no longer concentrated under him or her? How will Wall Street value these organizations? Will society's elite accept organizations that actively distribute power and wealth? Will society and its members willingly take on the responsibilities and duties that come with distributed authority? What will the legal system do with loosely associated organizations in which product liability is no longer directly attributable? All these issues will arise if and when these decentralized structures become more widespread.

Most systems can be thought of as collections of interactions between agents. If indeed organizations and markets can be thought of as complex adaptive systems, complexity theory tells us that the outcomes of these systems are completely unpredictable. Rather than trying to control and predict the future, organizational architects should be concentrating on identifying and enabling the conditions that make organizations
"infinitely malleable yet extremely durable," structuring them so that they may "evolve." In order to be successful in a world where the pace of change is accelerating, this kind of organization seems imperative, and this lack of traditional management essential. To quote Dee Hock one final time on the legacy of the Industrial Age, and the skills we will need in the future:

The essential thing to remember is not that we became a world of expert managers, but that the nature of our expertise became the understanding of management of constants, uniformity, and efficiency, while the need has become the understanding and coordination of variability, complexity and effectiveness.

– Dee Hock, September 27, 1994
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