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Profound. Provocative. Pragmatic



Historical Cycles of Disruptive Innovation

Excerpt: Navigating the Badlands

Chapter One

“Every few hundred years in Western history there occurs a sharp transformation. Within a few short decades, society rearranges itself—its worldview; its basic values; its social and political structure; its arts; its key institutions. Fifty years later, there is a new world. And the people born then cannot even imagine the world in which their grandparents lived and into which their own parents were born. We are currently living through just such a transformation” (Drucker, 1993, p. 50).

We are now some sixty years into a seventy-five-year historical cycle of innovation which should end around 2025. In such cycles, surges in new technologies lead to structural shifts in the economy, which in turn hit people full force, driving rapid and monumental changes in both business and organizational life. Pushed off balance, the economy churns and spins faster than society can respond, and social institutions begin to fail. As the cycle progresses, social issues, technological inventions, and economic shifts are all caught up in the maelstrom; we can scarcely differentiate cause from effect.

We have navigated through the Badlands for the last 15 years. Navigating the Badlands is a metaphor for taking the journey through the challenging transition zone between the end of the Industrial Era and the full promise of the Information Age. In every historical cycle of disruptive innovation, the Badlands is the rugged stretch that bridges the past with the future, a time after massive structural shifts have rendered the old economy and its social foundations obsolete, and new values and structures are not yet firmly in place. In the Badlands we experience considerable pain and bewilderment as one way of life ends, and we grapple with how to create the next.

At the end of this process, our very sense of identity breaks apart, opening the way for the emergence of a new sense of self, appropriate to the new context. At this point, social and economic drivers of change have come together again in a new, more stable pattern, bringing the cycle of innovation to a close—and another begins. We as humans have been in the Badlands before many times, indeed since time immemorial, for its ravines have always been a predictable part of every historical cycle of innovation and the disruption that attends it.

Times of innovation are inherently messy, making it difficult to match cause to effect. But we ultimately developed the view that disruptive innovations are part of a bigger cycle whereby new technologies, the economy, and society churn together to create an evolutionary leap in human identity. No one knows for sure exactly how many such cycles of innovation have occurred; scholars and historians identify and count them differently.

My colleagues and I settled on the belief that new technologies and their subsequent innovations don't directly cause social change; instead they create problems and dilemmas that drive society to seek new solutions from a diverse set of choices. This is the purpose of the journey through the Badlands. When cycles of disruptive innovations result in major structural shifts across all economic and social dimensions, as they are doing today, they create enormous transition costs as society struggles to move from one era to the next.

How well today's leaders manage the transition through the churning marketplace and failing social institutions of the early twenty-first century depends for the first time on a global cast of characters. Their knowledge of their colleagues around the world is incomplete; their ability to craft solutions together is untested; the stakes for all parties are extraordinarily high. The good or bad choices they make will lay the foundation for the next era. It is within this macro context that business leaders and organizations will continue on their journey.

Lessons from the History of Disruptive Innovations

“We are today on the rising slope of a third technological revolution. It is a rising slope, for we have passed from the plus-minus stage of invention and innovation into the crucial period of diffusion. The rates of diffusion will vary, depending upon the conditions and political stabilities of societies. Yet the phenomenon cannot be reversed, and its consequences may be even greater than the previous two technological revolutions that reshaped the West and now, with the spread of industrialization, other parts of the world as well” (Bell, 1989, p. 164).

The insights and lessons from historical cycles of innovation can serve as beacons in this murky landscape that we face. We examine eight such turbulent times, reaching back as far as 3500 b.c.e., when writing was invented, through our own time period, with all its breakthroughs in information, communication, and biology, ending with a forecast of the upcoming wave of disruptive technologies taking us through to 2025.

The following discussion is not meant to be exhaustive but rather to serve as food for thought, a means to extract lessons likely to be useful in the decade ahead. We can also derive some comfort from seeing that the human race has been in the Badlands before and thrived, although each cycle presents its own unique challenges. I encourage those of you with an inclination to delve deeper deeper into this history to take advantage of the resources of the Internet or any good library.

Times and Cycles of Disruptive Innovations: Selected Technologies

Bronze Age (circa 3500 b.c.e.): writing, pottery
700 b.c.e.: Greek Innovations: phonetic alphabet
100–999 a.d.: Period of Chinese innovations—classics on stone, elementary zoetrope, books printed
1400–1499: Renaissance—Printing technologies
1650–1690: Penny press
1760–1830: First Industrial Revolution
1860: Vaccines
1870–1914: Second Industrial Revolution
1920–1945: Nuclear bomb
1950–2000: Information and communications
2000–2025: Biotechnology, materials sciences, environmental technologies, & combinatorial innovations at their intersections.

Historical Lessons

- Change comes from the fringe as stasis grows at the center.
- Dynamic trading and human migration stimulates innovation.
- Social ferment feeds commercial innovation.
- Interchangeable parts and standardization provide infrastructure for the next cycle.
- Innovation requires optimal diversity.
- Mismatch of scale produces instability and breeds innovation or dysfunction.
- New Self-Concepts: "Identity" derives from innovation.

Lesson One: Change Comes from the Fringe as Stasis and Corruption Grow at the Center

Innovation usually springs up at the edges of established centers of power and wealth, and is often created by people who seem less than central to the day. Often they are people from newly emerging economic classes and occupations, dissatisfied with current conditions and imagining ways to change them. By definition the centers of power tend not to be responsive to outsiders. Having created large, complex systems to sustain its power, the center responds to dissatisfaction and innovation from the fringe by ignoring or contesting them; tensions rise as new ideas take hold. Corruption of the powerful increases as they feel increasingly threatened. There is no better historical example of this lesson than from the Middle Ages and the Renaissance, when the Catholic Church was a monolithic force in control of knowledge and, therefore, of people's lives. Merchants and traders on the fringe of society absorbed new ideas on their travels and invented places people could gather to discuss ideas outside of churches. Soon there was a growing desire for knowledge among ordinary people.

The Catholic Church tried to squelch both the ideas and innovators, calling them heretics and damning them as opposing God and Church beliefs. As the Church's power became increasingly undermined by trade and literacy, it became more corrupt in its

quest to cling to power, a grip that was ultimately broken by the invention of printing technologies, making possible a surge of innovations from creating maps to books to the reorganization of knowledge into new fields such as architecture and engineering. What followed eventually developed into the Age of Enlightenment, in the century that saw the formation of the United States of America.

Today we can see all about us examples of tensions between innovators on the fringe and those at the center who hold fast to the status quo. Consider Linux developers and their open-source software, with its implicit threat to New Economy juggernauts like Microsoft, who try to monopolize markets by excluding others.

Think about Move On, a sociopolitical movement organized on the World Wide Web and focused on transforming the American political process, and how it creates tension with the existing political process. Consider microenterprises in towns and villages all around the world funded by small loans to women (initially provided by the Grameen Bank), which are growing in importance to economic development and being called into question by such large institutions as the World Bank. Think about the tension between apartheid in South Africa and the popular power of Nelson Mandela. Look at the festering corruption at the center of powerful corporations such as Enron, Tyco, Arthur Andersen, Global Crossing, and WorldCom, which tried to quell the voices of heretics opposed to their corporate ways. Think about the Bank of China scandals in Beijing as the government pushes for major reform.

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Lesson Two: Dynamic Trading Stimulates Innovation

As traders travel to sell their wares, they collide with new ideas and diverse people and must learn to adapt their products to fit alternative ways of living. They also bring news of these dissimilarities back home, which stimulates more people to travel to expand their

ways of living.

In the Bronze Age, from 3500 to 3100 b.c.e., hunting societies transformed into farming societies and trade began. This was the earliest time period we studied, a time when writing was invented, allowing people to transmit and store information beyond the reach of human memory for the first time. writing was invented, allowing people to transmit and store information beyond the reach of human memory for the first time.

The first cities sprung up in today's Iraq, and an urban economy rooted in trade was established. It began with innovations in crafts, including specialization and early forms of mass production. Sumerians invented the potter's wheel to manufacture vessels that were then traded over vast distances. This in turn demanded innovations in recording systems for tallying inventories, shipments of goods, and payments. Merchants needed to preserve records of their transactions to resolve disputes. Building on the innovation of writing, they created clay envelopes that could carry and store tokens of commerce and make for ready filing in libraries.

Today, dynamic global trading is also stimulating a multitude of innovations through the distribution of high-tech industry, what I call the "Global Silicon Network" (GSN). Talented engineers migrate from India, China, Israel, and France, to name just a few countries, to California's Silicon Valley, where they learn technical and organizational innovations and return home to start similar science and business endeavors, creating whole new industries in their countries.

In this way social innovation spreads as well. Through business travel, many educated women meet similar women in other countries, giving rise to global organizations such as the International Women's Forum that allow women to support each other globally to achieve common social goals and to advance the role of women in society.

Lesson Three: Social Ferment Feeds Commercial Innovation

The context in which innovation takes place is absolutely crucial. Both disease and war give rise to innovation whereby additional clusters of innovations build one upon another. Louis Pasteur, a “fringe scientist,” demonstrated the power of laboratory medicine by helping to end the threat of anthrax to cattle in the 1880s. He took his laboratory to the field and cultivated the anthrax microbe, and created the first vaccine. This was a small-scale experiment with a big ripple effect, creating a new theory of vaccines, launching the beginnings of the modern public health movement, and extending the practice of medicine to the farm and other commercial areas.

Through this successful, and certainly disruptive, innovation, the scientific method became accepted and led to the use of statistics to chart the rise and fall of disease—one of the biggest stepping stones in the development of epidemiology since the invention of the microscope in the late 16th Century. This surge of innovations launched a new relationship between science and society that is pervasive in our lives today.

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Social ferment has been a hallmark of our current cycle of innovation, beginning with the protest movement in the 1960s in the United States. The segregation of blacks and whites created intense social ferment that led to all sorts of social innovations from new social organizing principles and practices to the Civil Rights Act of 1964 to voter registration drives. Activists used this new knowledge about organizing against corporations. from new social organizing principles and practices to the Civil Rights Act of 1964 to voter registration drives. Activists used this new knowledge about organizing against corporations.

One such effort was led by a fringe leader named Ralph Nader, who successfully sued

General Motors for harassment he experienced in response to his negative book on the Corvair. This led to commercial innovations to create safer, higher-quality products. Saul Alinsky led a shareholder protest against Kodak. Recent similar movements like Move On's political efforts are examples of leveraging commercial innovation, in this case the Internet, to resolve social issues.

Lesson Four: Innovation Requires Optimal Diversity

Disruptive innovations are not engineered; they arise spontaneously, fueled by dynamic interactions between diverse people. They occur when people are motivated to think and act in new ways, and when there is a rich variety of ideas and perspectives. Preceding examples alluded to the importance of the diversity that occurs in dynamic trading, during social ferment, and among the heretics and mavericks on the fringe. One impressive story of the role of diversity in innovation was the production of the nuclear bomb in the early 1940s, during the historical cycle of innovation that preceded the one we're living in today.

Even though H. G. Wells forecast the possibility of a nuclear bomb in 1914, and scientist Leo Szilard is the legally recognized inventor of the atom bomb through the patent he filed in Britain on July 4, 1934, the bomb as we know it was developed by the Manhattan Project in the United States under the scientific leadership of Robert Oppenheimer. The diverse gathering of scientists that contributed to the Manhattan Project might not have been possible were it not for Hitler's persecution of the Jews, driving much of Germany's intellectual elite to flee to the United States. In his maniacal drive to persecute a minority, Hitler also succeeded in slowing the pace of war technology in Germany.

A further contribution came from Vannevar Bush, the head of the U.S. Office of Scientific Research and Development, who provided the radical idea of putting together scientists and engineers. From the very outset, Oppenheimer demanded a new approach to the work on the bomb:

We need a central laboratory devoted wholly to this purpose, where people could talk freely with each other, where theoretical ideas and experimental findings could affect each other where the waste, frustration, and error of compartmentalized experimental studies could be eliminated (Weiner and Smith, 1980).

Oppenheimer was able to create much of this climate of innovation, despite the frustrations imposed by the need for secrecy.

Building the atom bomb created an unprecedented experience of community among scientists and engineers, as the exigencies of wartime dissolved the normal boundaries between disciplines and organizations. This restructured scientific research community became a nexus of institutions and people that created a new innovative culture of science. This was the platform for the disruptive innovations of the cycle we are in today.

Lesson Five: Interchangeable Parts and Standards Provide the Infrastructure for the Next Cycle of Innovation

In the early phases of innovation, different inventors often compete to get their standard adopted to gain bigger market share; social innovators compete for power. Once a given innovation has taken hold, the winning standards become the platform on which new innovations can emerge. Computer technologies that were created to track German aircraft and break Germany's secret codes became the standard for a series of simulation and gaming innovations that led to computer networks such as the ARPANET. These standards were widely adopted in turn, becoming the platform for this innovation cycle's communication and information technologies, which led to the Internet and the World Wide Web. There are many examples of this throughout history.

Eli Whitney's cotton gin in 1793 resulted in standardized forms and interchangeable parts for production of cotton, leading to increased production of a commodity that had been

available only to the elite, bringing it within reach of ordinary people. The steam engine harnessed a vast new source of power, leading to new feedback mechanisms such as float valves, centrifugal governors, and pressure regulators that enhanced the ability of the steam engine to adapt to various needs and made the access to power available all the time. It became the platform for a number of innovations that characterized the First Industrial Revolution: new industries, urbanization, year-round production, and reliable transportation, to name just a few.

Lesson Six: Mismatch of Scale Between Organizations and Social Issues Produces Instability

Institutional and organizational structures evolve to solve the problems and meet the demands of the times. They need to be the right size for the problems and issues at hand. As innovations build upon innovations, the economy changes and social issues shift, rendering a mismatch in scale between existing problems and institutions. This creates instability until enough organizational innovation takes place to begin to change the organizations enough so that they can begin to solve the new problems.

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Each historic cycle has experienced these mismatches. The guilds that formed around specialized crafts in medieval times began to decline in the sixteenth century. Their conservatism, monopolistic practices, and selective entrance policies developed in response to creating high standards for quality and a rigorous training program for new members wanting to learn the trade.

But as time went on they became centers of power that dominated town and city governments and became hostile to technical innovations that threatened their economic interests. They set extremely high standards for apprentices and journeymen, slowing

industrial growth. But as demand for products grew and capital became more available, merchants set up different kinds of companies to compete with guilds, exploiting new production technologies to produce more goods for the growing middle class. The guilds broke down under this pace of new technologies and trade, their restrictive cultures unable to respond fast enough once their control was broken.

Today, most organizations and institutions developed to solve the problems created by innovations of the Industrial Era. In fact, the modern corporation developed to support mass production and manufacturing. Organizational innovations ranging from Frederick Taylor's scientific management (which viewed both people and organizations as machines) to Henry Ford's mass production assembly line fit the needs of the times. They enabled scalability, standardization, and mass merchandizing. As the Information Era (which arose in the 1950s) matures, it requires new forms of organization based on innovation, globalization, and knowledge work. It should be no surprise to see Industrial Era structures breaking down around us.

Lesson Seven: New Identities Evolve from Innovation

The human sense of self also evolves as history unfolds and the context of life changes. As clusters of innovations are adopted, they reshape the economy, the society, and daily life. Identity is a set of reference points, markers that individuals use to distinguish themselves from others. They include everything from your name to your role at work to your group memberships to your national and global identity.

Reference points change during cycles of innovation. The reference points we have today are more diverse and numerous than at any point in history, and they are dramatically different from previous cycles of innovation. Identity no longer answers the question, "Where have I been placed in the world?" It is no longer defined by bordered places.

The sense of identity has changed dramatically over the last five hundred years. It has gone from a God-centric sense universe to a materialistic idea of who we are. Ordinary

people have become more important too—it is not just the wealthy who have power. As Chandra Mukerji described in a lecture at UC San Diego in 2000:

The rise of trade changed all this; the newly wealthy were merchants, not nobles. Due to their links with other parts of the world they could consider themselves in terms beyond their immediate neighbors. As Mukerji says, “They could become cosmopolitan consumers and members of imagined communities.”

The Badlands of the Renaissance embodied the Reformation and Counter-Reformation and the reconfiguration of the religious and secular world. It was caught up in the chaos of painted images of God and Heaven being replaced by maps of trading routes, as the natural order was re-imagined not just as the domain of God, but as a resource for business and commerce. Today, once again, we are challenged to represent ourselves when so many of our local and global reference points are being dislocated by multiple short-term relationships in both a physical and an electronic landscape. What markers

Prior to these developments, a high degree of localism and determinacy measured your life. If you lived in a rural town and lived more or less directly off the land, as did most people in the Middle Ages, you had no reason to imagine who you were as a person or what community you belonged to. It was obvious. You were what your community knew you to be, and your community was made up of the people in your town.

represent your truly authentic self? And in this increasingly complex world our sense of “we” becomes as critically important as our sense of “I.” Knowing who “we” are—and how that group identity fits with “I”—is especially important in an economy where the creation of knowledge is achieved through the collaborative sharing and sense-making of small groups of people. For this to occur, there must be deep trust.

Implications

If we can learn from the lessons of the past, they can help us stay oriented in a landscape with few clear paths through it. Here are a few implications these lessons provide for today's journey through the Badlands:

- We are at the point today where the economy is churning faster than society can respond to it. We need to focus on the new problems and issues this creates and not get lost in old ideas and processes that could prevent us from surviving this journey. We need new and better leadership to design new kinds of organizations at all levels to match the needs of tomorrow.
- The dramatic changes we need to make can come from listening to new voices. The tension between the fringe and the center provides fertile ground for innovation; embrace it, don't try to squelch it. Leaders in business, government, and nonprofits need to make contact with their fringe—the heretics and mavericks and young people who inhabit those marginalized places.
- Dynamic world trade that takes advantage of the technologies of connection provides an opportunity for the betterment of all people. It is our choice to seize it or not.
- Today's social ferment from growing global networks is the breeding ground for radical innovations, for good and for ill. Social experimentation with new disruptive technologies will be a prominent feature of the next twenty years
- Attempts to monopolize information and knowledge by powerful institutions will break down in today's societies, just as they did in the Renaissance

Implications (Cont'd)

- Innovation requires optimal diversity, which can come from many sources—geographic, cultural, interdisciplinary, and intergenerational, to name a few. Keep seeking collisions with the new, and engage deeply in cultural learning to achieve the mix needed to create a vibrant global society and economy.
- We are in a cycle of disruptive innovation where new knowledge, not just technology, continues to explode across myriad disciplines, from physics to biology to energy. This is changing our fundamental knowledge base, which will result in a new identity.

Parting Thoughts

The world has changed in the last fifty years as much as at any time in human history, if not more so. It will change as much again in the next twenty-five, as we come to the last phase of this seventy-five-year historical cycle of disruptive innovation. We have passed the point of no return; taking the rest of the journey is not optional. At the end of it, the future that we weave together will not resemble the past.

As in the Renaissance, much of the transformation will be caused by the continuous creation not merely of new technologies, but of new knowledge. This extraordinary period will be similar to the explosion of knowledge and social reorganization that occurred after the Middle Ages, and before that with the invention of writing in the Bronze Age.

As the twentieth century ended, we slipped into the Badlands phase of this cycle. With the loss of the easy wealth creation in the late 1990s and the financial crisis and Great Recession of 2008 we find ourselves less resistant to change. Now the transformational effects of the Information Revolution are taking hold. They will change the very way we do business and organize our work at the center of our lives. They have transformed our daily lives and caused the demise of most social institutions. We truly have passed the point of no return. The phenomenon of the Information Revolution can't be reversed, and it will reshape not only the Western world but the entire world as well.

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The fact that this journey is a global one adds to it both intensity and complexity, promising everyone an experience that will mark their lives like no other in history. How well today's society can manage the transition through market mechanisms and political forces will

lay the scaffolding for the next era. The challenge is daunting, yet that is the task at hand. By the end of this long journey through the Badlands, your life will have changed in the most profound ways. Not only will your work and organizational life transform as you shift your commitment from local to national to planetary, your very identity will also change—your sense of who you are and what you mean on this earth. Welcome to the End of Badlands. It is now time to take the journey of your lifetime!

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