



**Taking the Uncertainty out of Uncertainty:
The Power of Pattern Recognition and of Learning from History**

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1. Distinguishing between Risk and Uncertainty

When you know the risks you face you can play the odds. When you have only uncertainty you cannot begin to figure out what the odds are.

Managing risk is *conceptually* easy: You calculate the odds and you use this information. You're at the Black Jack table, holding a pair of jacks, you've counted the cards already played, and you know whether or not the odds favor standing pat or doubling down. When managing risk, you work the odds, and in different settings you hedge, you buy an option, you buy an insurance policy, or you drop out of the game. Deciding how great your exposure is, deciding the probability of loss, and deciding how much you are willing to pay for protection need not be computationally easy, nor can you always obtain reliable data, but at least you can describe the problem that you are trying to solve.

Managing uncertainty is different from managing risk and is intrinsically more difficult. You do not know the details of the situation you are facing, and you don't know how to assess the odds. You're holding the same two jacks, but the dealer has not yet told you if you are playing Texas *Hold 'em*, 5 Card Draw, or Black Jack. You don't know the game, but the dealer wants your bet now. With uncertainty you can't play the odds until you know what scenario you are actually facing. You can't hedge or protect yourself, because you don't yet have enough information for even the most superficial analysis.

**2. Converting Unknowable Uncertainty into Knowable Risk —
The Role of Recognizing Recurring Patterns**

Perhaps the most effective way of dealing with uncertainty is finding the environmental cues and early indicators that let you know what scenario you're in, what game you are playing, and what

situation you are likely to face. You can now convert an unknown and uncertain situation into a situation that is at least partially known, and at least entails understandable risks. The most powerful tool for dealing with uncertainty is developing enough pattern recognition skill to convert an unknown and uncertain situation to a known and risky one.

Physicists have been trained to analyze problems by looking for patterns and simpler analogous structures, which often emerge after embedding their unsolved problem in a larger problem, or after pushing critical assumptions to their extremes to allow the solution simply to fall out. These techniques often transfer over directly to business environments.

When attempting to make predictions about the future of online travel agencies and online grocery sales in the US in 1996, it was difficult to analyze either in isolation. I was asked by the Chairman's office of both a major European transatlantic carrier and a major European consumer packaged goods manufacturer to consider what would happen if they attempted to bypass their traditional distribution partners and sell directly to passengers or to consumers. Putting the two problems side by side, the differences between the two made the future outcomes clear, even before either had been seriously attempted: Travel is easy to describe online with a simple and unambiguous interface; each grocery product needs a different and potentially subject set of terms. eTickets are easy to distribute, eCoffee will not get you up in the morning. One industry is easier to enter than the other. Some business travelers booking the Concorde or first class transatlantic travel were extremely profitable to serve while other leisure travelers were time consuming and unprofitable; there was no comparable difference in the service demands or prices paid by shoppers buying a 64 oz bottle of detergent. One industry allows you to achieve profitability by targeting select customers, while the other demands market share. Finally, because targeting of business travelers was attractive to airlines, they could develop a strategy to target them, putting up websites that assisted in making reservations, and only later switching these sites over to compete with agencies. Once the switch was made, adoption was so rapid that agencies were unable to retaliate, and airlines slashed the commissions for those customers still served by agencies. In contrast, there is no targeting strategy that would result in rapid adoption of online grocery shopping, the threat of retaliation by major retailers was real, and no effective bypass strategy has been attempted by a major consumer packaged goods manufacturer. The same analysis suggested that if online grocery shopping were to emerge it would result either from new entrants committed to online sales or as a value-added service offering from traditional grocers. Indeed, the experience of Fresh Direct (freshdirect.com) in the US and Tesco.com in the UK, supports this.

The use of pattern recognition and an understanding of a set of historical precedents transformed our analysis from one of uncertainty to one of risk; that is, we took the uncertainty out of an uncertain situation by identifying which scenario we now face. We are still in a risky situation, but at least we know what game we are playing; we are playing Texas Hold 'em, not Black Jack. If we're Wal-Mart or Tesco we stay in the online grocery game; if we're J&J, Procter & Gamble, or Unilever we drop out.

Reducing Strategic Uncertainty by Finding the Box

Popular wisdom tells us that organizations suffer when their management teams cannot “think outside of the box.” Popular wisdom is, once again, wrong. Fast fixes for strategic thinking are like fast food, and are more likely to produce satisfying slogans than satisfying results. “*Think outside the box*” is entirely too much like “*think outside the bun*” for my taste. All too often, we are unable to think outside of our comfort zone and unable to make decisions other than the ones we would have made five, ten, or even fifteen years ago; we are unable to see the way that the world has changed. “*Think outside the box*” does not mean “*act at random because you may get lucky,*” but rather means “*think outside your old comfort zone because the box has moved!*”

Missing the moving box results in strategies that are slightly off, slightly mis-timed, and capable of producing unpredictable and less than perfect results. But deliberately trying to think outside of the old box, rather than thinking inside the box’s future location, often produces results that are even more random, even less likely to draw on existing organizational strengths, even less likely to respond to emerging strategic imperatives, and even more likely to provide unsatisfactory results.

Unfortunately, the pace of change has been constantly accelerating, forcing all of us to respond faster and faster, and with less and less complete information, and with less and less reason for confidence. This leads to the failure to understand what business conditions we are going to face, rather than to problems with our ability to respond to conditions once we know what we are facing. Executives need to learn to anticipate change and to recognize patterns quickly, so that they know what they are about to see, and when and where they have seen something similar before. This will enable them to apply their considerable expertise to the correct problems, to do so more rapidly, and to achieve better competitive results.

Fortunately, the environment that defines that box in which corporate strategies must fit moves in ways that are predictable, and indeed have been predicted. For the past 20 years our Wharton team in *Information, Strategy, and Economics*, has studied and predicted the ways in which changes in the cost, availability, speed, and accuracy of information would change all aspects of the competitive environment faced by all businesses. Indeed, the greatest contribution our program has made has come from gathering together executives from a range of industries and working with them to anticipate and understand environmental change.

3. Remembering and Learning from History

A quote from Chancellor Bismarck of Kaiser Wilhelm’s Germany provides the best motivation for learning from historical patterns: “*Fools say that they learn by experience. I prefer to profit from the experience of others.*” This, of course, is exactly what we are suggesting ... not simply learning from your own experience, but learning from the experience of others, no matter how remote in time or space, as long as it provides a good set of patterns for interpreting your own experience.

But how do we know what to look for? How do we characterize 500 years of western economic history, or even 100 years of western business history, so that we know what to look for? Military history, the clash of states, cultures, and civilizations, follows sets of patterns. Are there similarly compelling patterns in the competition between American and Indian software firms,

between American and Chinese textile manufacturers, or even between Indian software vendors or between American banks?

We believe that there are reoccurring patterns, and that learning to spot them has great value in strategic planning. Learning to spot patterns in business can benefit from understanding the way others have been trained to search for patterns in the sciences. Physicists look for symmetries, and for conservation laws like conservation of energy, mass, or momentum that can be applied in the behavior of dynamic systems. Engineers look for forces and equilibria. What should executives look for?

4. Recognizing Patterns in the World of Business and Strategy

In my MBA course at Wharton, students work with examples of strategic decisions to learn to divide the business world into reoccurring patterns in the same way that a physicist does. These may not be patterns that reveal the inevitable structure of the universe, or the invisible hand of God in its design. Rather, these patterns simply represent the forms that we have observed, time after time, in the competition between firms operating as economic entities. While by no means complete, exhaustive, or even entirely non-overlapping and distinct, the following short list has been very helpful: when we see enough to recognize the pattern then we can develop a strategy, assess the odds of success, consider resources that might be necessary to deploy when pursuing a strategy, and determine what those resources might be worth.

4.1. Newly Vulnerable Markets Experience Opportunistic Pickoff

Industries that undergo discontinuous change may become vulnerable to attack by new entrants, even though those industries might appear fully mature and fully saturated, and might have exhibited profound economies of scale. These industries, which we call newly vulnerable markets, have the following three characteristics in common:

(1) They are **newly easy to enter** in ways that they had not been previously. Deregulation made it easier for companies to compete in the US telecommunications marketplace, while technological innovation made traditional copper networks less valuable, made installing new networks more attractive, and made the interconnection and interoperability of separate companies as effective as an integrated telephony monopoly. Markets that are newly easy to enter may not be desirable to enter, but new ease of entry is a precondition for an increase in vulnerability.

(2) Many industries that had been protected through barriers to entry exhibit naïve and simplistic pricing strategies. Firms often employ uniform pricing policies, charging all customers the same prices regardless of their risk, their cost to serve, or their profitability. This can be for regulatory reasons, as it was with telephony, or for historical reasons, as it was with credit cards in the US. When customers exhibit strong differences in the factors that affect profitability, but are charged uniform prices, the marketplace has large differences in profitability among different customers, which we call the ***customer profitability gradient***. When the industry was safe from attack, differences in customer profitability were of little significance, but when new entrants with new strategies begin to attack, the incumbents' strategy of overcharging some customers while undercharging others creates very attractive targets for new entrants. The customers who have been overcharged are both very profitable and in many settings very easy to recruit. A firm that learns how to exploit this will find that the market is **attractive to attack**, the second necessary condition for a newly vulnerable market.

(3) Finally, there are established players who, when attacked by new entrants, are unable to match the entry strategy of their new competitors. When MCI began opportunistic pickoff of AT&T's long distance customers, regulatory policy prohibited AT&T from taking effective defensive action. When Southwest Airlines and other discount carriers began their attack on American, United, and the other full network airlines, the incumbents could not match the strategy of their attackers: (i) they needed to maintain a full route structure, while the attackers could fly only high traffic routes; (ii) they needed end to end luggage handling, while the new entrants could begin with point to point operations without luggage connections; (iii) and for a variety of other reasons, established carriers were unable to match the initially lower labor costs of the new low price carriers. When Capital One (Signet Bank at the time) began to pick off only the most profitable customers of their competitors, by offering lower interest rates to customers who paid finance charges every month, competitors were unable to respond because they needed the excess profits from these customers to subsidize the less profitable service provided to other customers. This final condition, inability to respond, makes a market **difficult to defend**.

In a range of service industries, from banking, credit card operations, brokerage and insurance, to air travel and telecommunications network operations, we have seen changes create and transform newly vulnerable markets.

4.2. Transparency inevitably increases price-based competition for commoditized offerings

The changing nature of securities trading and securities firms was predictable: as markets became more transparent, market prices became more visible to customers, and customers' access to trading became easier, traditional retail trading became less profitable, online trading firms expanded, and exchanges lost volume to off-exchange electronic alternatives. Our first experience with this came while studying the International Stock Exchange (London) in 1986, immediately after *Big Bang*. London had become by far the most international exchange in the world, with foreign volume actually greater than domestic volume; in contrast, at the NYSE foreign turnover was less than 5% domestic volumes and in Tokyo the percentage was even smaller. The impact on the Stockholm and Paris Bourses was dramatic, with double-digit percentages of trading volume moving from their domestic markets to London. Despite the apparent success, the impact on London's brokers and market makers was catastrophic; spreads and commissions collapsed in London until the Elwes Commission found ways to restore profitability. The effects of transparency and online market access are not limited to London; more recently, specialists' spread have gone from eights to cents, and the bulk of Nasdaq's volume now trades on off-exchange ECNs.

Likewise, transparency and online access have affected other industries outside financial services. The tremendous pressure on airlines and hotels when they have excess capacity, customers think their offerings are interchangeable, and everyone knows everyone else's prices and seat or room availability, was extreme and predictable; the bankruptcies among America's major airlines were likewise predictable.

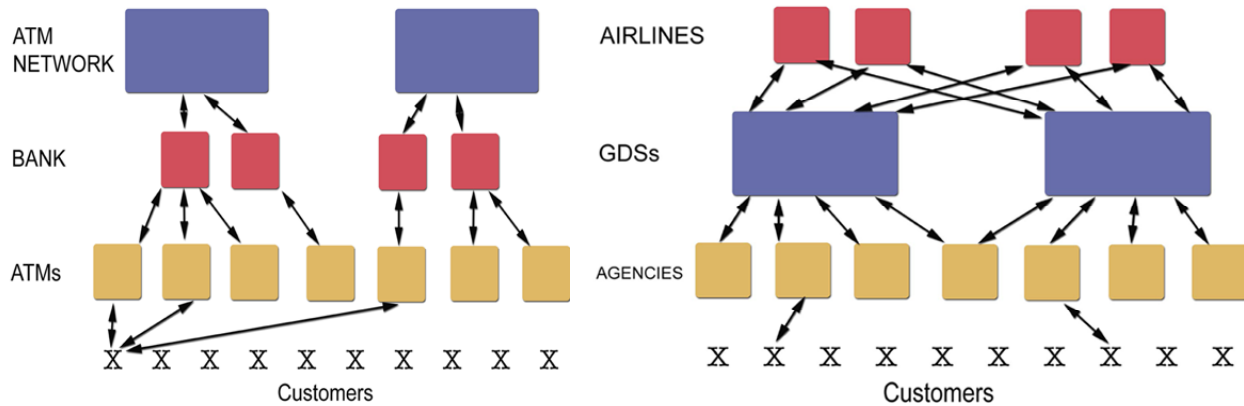
4.3. Network Geometry Predicts Power in Distribution Channels

In many industries, geometry is destiny. Who is closest to the customer may determine the allocation of profits within a distribution channel, unless other network factors, like the ease or difficulty of bypassing a level of the channel, affect that level's profitability.

Even though there were competing CRSs (travel agents' computerized reservations systems) during the mid 1980s, they were able to exert monopoly power over the airlines that were dependent upon them for the sale of their flights. In the early 1980s each travel agency would use one and only one CRS. Thus, if an airline were to be dropped from a CRS it would lose 100% of the access to those agencies who were served by that CRS; although the CRS market looked like an oligopoly, it was in fact a collection of parallel monopolies. When Frontier was dropped from United's Apollo system, it was forced into bankruptcy, opening the way for United to create its hub in Denver, Frontier's base of operations; similarly, when Braniff was dropped from American's Sabre system, it too was forced into bankruptcy, allowing American to create its hub in Dallas, Braniff's base. The structure of the network explains the location of power: the reservation system served the travel agents, who served the customers, and there was no direct link between the airline and the agency or between the airline and the customer. Often neither a travel agency nor the agency's customer was aware that there were flights that were not available to them and they merely booked a flight that was available, without loss of revenue to the CRS or the agency; in contrast, the loss of revenue to carriers, such as Frontier and Braniff, was demonstrably catastrophic.

In America during the 1980s the banking system was extremely fragmented, far more so than in the UK, and it was not uncommon to have several small banks in each metropolitan area. Since none had the scale or the market share needed to provide truly cost effective ATM service, or ATM coverage that was sufficiently widespread to be truly convenient for their retail customers, they cooperated in the operation of shared ATM services. Sometimes these network providers were owned by several banks, like NYCE in New York; in other cities the shared service was owned by a single bank, like Philadelphia's MAC. Sometimes there might be more than one network in a city and sometimes there would be only one. Interestingly, even, where there was only a single ATM network, and even when that network was owned by a single local bank, a monopoly service provider like MAC was not able to earn monopoly profits. First, ATMs were closer to the banks that owned them than to the network provider in the network structure shown in the figure below; since each bank operated its own ATMs even denial of service by MAC would not have prevented customers from using their ATM cards at their bank's own machines. Second, there were far fewer banks than travel agencies, and they all had identical interfaces for ATM service since they used the same service provider; had MAC threatened its member banks they could easily have arranged to bypass MAC entirely and swap transactions among themselves. Bypassing MAC as a switch was relatively easy for banks; bypassing the reservations systems and reaching out to travel agencies would have been quite difficult for airlines.

Geometry is indeed critical here. The most obvious difference between the structures of the two networks is that in the ATM network the customer went to an ATM, connected to the bank, which was then connected to MAC. Denial of service was never total, and had denial of service or excessive pricing become problems it would have been easier for the banks to bypass MAC than it would have been for MAC to bypass them. In contrast, the airlines were never directly connected to their customers, or even to its customers' agents; denial of service to an airline by Sabre or Apollo was total, within the population served by each CRS, bypass by the airline was infeasible, and power resided with the CRSs. This difference is shown in the two figures below. Similar interactions between power and geometry can be found in other industries, ranging from insurance sales to traditional retailing.



5. Using Patterns in the World of Business and Strategy

So what can we actually do with this idea of pattern recognition as a means of converting uncertainty to risk? We have found it extremely powerful when helping client organizations analyze threats and opportunities they face. For example, we worked with a major hotel chain, helping them deal with an extremely uncertain situation: what was happening in hotel distribution, and how would online travel agency systems like hotels.com affect their business? Would this be a new, low cost ally helping them sell excess capacity, or an expensive and exploitive competitor to their own distribution systems? We started by looking at patterns from business history that suggested both the risks they would face and the solutions they might employ.

Attempting to develop a strategy with them as they attempted to regain control over its prices and its distribution, we did the following:

- **Understand the problem:** Recognize that if their offerings were seen as commodity hotel rooms, identical to all others, price transparency would destroy profits. This was indeed happening, which forced the chain to view third parties' online distribution systems more as an opponent than as a distribution partner.
- **Find their opponents' weakness:** Recognize that the current channel geometry represented a significant threat to power and profits, since the online agent was closer to the customer, in that the customer would go to the online agency rather than to the hotel to make a booking, and since there was little reason for the customer to book any other way. We needed to work to change the geometry. We realized that we needed to create sufficiently attractive offerings that could not be booked through hotels.com or orbitz because they were too complex to describe, and entailed too many details, to be handled by the pre-existing user interfaces.
- **Exploit their opponents' weakness:** Determine what new offerings customers wanted and use this to make products less routine and interchangeable. As products become more complex and more amenable to customization for individual guests, it becomes essential to capture more information than online agencies generally have. For example, Crowne Plaza allows guests to pre-book specific pieces of in-room exercise equipment like a treadmill or StairMaster; online travel agencies cannot accommodate this, but few guests are even aware that this is an available option. Hotels at international airports often guests to specify a check-in and check-out time dramatically different from the traditional 3 PM in / noon out window, and again, online agencies cannot yet

accommodate this. A move to booking options that guests want, and that online agencies cannot process, would shift the customers' booking preference and move the hotel closer to the customer than the online agency is now. This would shift customers away from hotels.com and orbitz, towards the chain's own websites and reservations centers, or towards travel agencies that used the chain's distribution systems.

- **Implement a strategy that is difficult for their opponents to replicate:** Partly this entails product and service offerings that swamp the infrastructure of the online agencies, as described above. Most importantly, it was hoped that the hotels could win customers over from the online agencies by having them join the hotel chains' own frequent guest clubs, track their preferences, and reward them in ways that were based on more information than would be available to the online agencies. For example, the hotels know when they have excess capacity and they can reward customers with room upgrades, giving larger rooms, or rooms with better views, to customers who value them; since upgrades to members of the hotels' frequent guest clubs are issued out of excess capacity they cost the hotels little or nothing to provide. The online agencies do not have access to the hotels' full inventory information, nor do they have access to guests' profiles within the hotel chains; they cannot perform the same upgrading functions.

The risks were that third parties would capture enough market share to become essential before the chain could develop alternatives for customers to use, that the chain's new offerings would not be sufficient to drive customers to them and to the chain's websites, or that for other reasons customers would not use the chain's own websites and distribution systems. These were risks that they understood.

6. Conclusions

Uncertainty is nearly impossible to manage — you don't have enough understanding of the structure of the situation you face to delimit the set of future possibilities or to assign odds to them and plan effectively. Risk, while neither safe nor certain, is much easier to manage — you can list the alternatives you face, assign probabilities to them, and plan your responses and your hedging activities. Pattern recognition is an essential step in converting an unknown and uncertain situation into a more structured and more manageable one.