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# Abduction: a pre-condition for the intelligent design of strategy

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A division manager explores possible explanations for some unexpected news about competitor and customer behaviors. A criminal investigator examines the evidence from the crime scene and a psychologist's report about the accused person, seeking as she goes an explanation that fits all the facts. An archeologist sifts through fragments of pottery trying to find an explanation that would tie all the ancient pieces together in a coherent way. A commander attempts to devise the best explanation for conflicting reports of recent enemy behavior. United Nations investigators attempt to explain facts collected about the weapons development programs of a nation.

What do these situations have in common? They are all examples of working from a limited set of data or evidence to come up with the best possible explanation, a kind of thinking that is known to psychologists and philosophers as abduction[1]. Abduction is about making inferences from information that is surprising or anomalous, which are both very typical in strategic decision making.

Strategists can gain a lot from knowing how to use abduction well. Great decision making is based to a significant degree on skills that are not commonly recognized. One misconception, for instance, is the belief that the art of good decision making lies in the exercise of choosing – but the final choice is only as good as the set of alternatives chosen among. Designing a good set of alternatives to choose from, and seeing new possibilities, is foundational, as the article in this issue of *Journal of Business Strategy* by Friedel and Liedtka (2007) demonstrates.

Abduction goes even deeper. Conjuring up solutions to design problems is a well-recognized skill of great designers, but their ability to devise new ways of looking at the problem in the first place is key as well. This is where abduction comes in. The genesis of new designs, whether industrial, architectural or strategic, lies in the initial guesswork that designers do about the nature of the problem they are facing. It lies in making inferential leaps from a collection of raw data about a design situation to some plausible hypothesis about the underlying issue. Detecting what the problem ''really'' is – this is the starting point for creative design. This guesswork is important because it informs which range of solutions is considered and sets the boundaries for the kind of option ultimately chosen.

Abduction, it turns out, plays a critical role in design thinking and is a process frequently integral to problem defining. Problem defining, in turn, sets the stage for possibility thinking. Therefore, good abductive thinking is a pre-condition for intelligent designing.

Strategists, then, need to pay much more attention to the process of abduction and how they come up with tentative guesses about the problem situations they face because these guesses are a vital part of the process of designing strategy. Without high quality explanations about the bloomin' buzzin' confusion of information we face today, there is no ground on which to build strategy for a new future.

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## What exactly is abduction?

Strategists spend a lot of time and effort trying to understand data – new facts about competitors, about customer buying trends, about how stakeholders are reshaping the strategic environment and so on. Some of this data fits into existing explanations about behavior, but when all the facts do not fit, strategic decision makers have to get busy building new theories that explain what they see. This is abduction – making guesses about the best way to explain a collection of surprising or anomalous facts.

One of the easiest ways of quickly grasping the concept of abduction is by comparing it to two other very common modes of logical reasoning: deduction and induction. With deduction, your conclusions follow from your premises. For example, all roses have thorns; this is a rose; therefore it has thorns. Induction works in the opposite direction, from cases to general principles. For example, these plants are all roses; they all have thorns; therefore all roses probably have thorns. Abduction is less like these logics and more like inspired guesswork. It describes the operation of making a leap to a hypothesis by connecting known patterns to specific hypotheses. For example, all roses have thorns; this plant has thorns; therefore it might be a rose.

Decision makers make these kinds of hypothetical leaps all the time. Much of this abducing process happens unconsciously. Because human beings in general are superb pattern recognizers and adept at dealing with imperfect and partial knowledge, they tend to abduct quite readily. There are times we even abduct too readily, a phenomenon commonly referred to as ''leaping to conclusions.''

Abductions have three characteristics: plausibility, defeasibility, and presumption. First, plausibility. Consider the classic Sherlock Holmes murder scene and the conjecture, ''It must have been the butler who did it.'' What makes this a plausible explanation for the dead body found in the kitchen? Plausibility just means that something seems to be true based on appearances. What's plausible depends on the data we have to hand. Are there prima facie reasons to support the claim? Does the conjecture reasonably account for all the facts we are taking seriously? At minimum, plausible conjectures must be live possibilities – they could be true. Of the available hypotheses, some will be immediately rejected; but ones that appear plausible may be conjectured. Then we use the ''compared to what?'' test. We ask which of the available hypotheses seems the most plausible? We test our confidence in an explanation by past experience with similar situations or based on our imagination, and when we conclude that we cannot think of a better explanation, then we have settled on what we think is the most plausible alternative.

These guesses are tentative and temporary. We doubt that we have considered all of the alternative hypotheses. This brings us to the second characteristic of abductions: they can be said to be defeasible, which is a fancy way of saying they are subject to further considerations. So an abductive conjecture is one that can be abandoned if the strategist identifies a more promising hypothesis. Consider a fictional example of market research on consumer eating habits. Based on the available data, we might abduce that the candy market is generally growing. But then new evidence emerges which suggests that it is really just a sub-segment of the market that is growing – say the retiree candy market. We instantly drop the previously preferred hypothesis in favor of a new one. What defeasibility underlines is that because the essence of abduction is moving forward based on a hypothesis which is merely plausible, we are obligated to give up that hypothesis should we come up with a

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better one. Guessing is allowed, even if there is little support for the initial best guess, on the basis that it will be given up later if the burden of proof shifts. In a sense, we can think of abduction the way biologists have taught us to think of the coral reef: each abduction is like a layer of coral that in turn dies off and provides the foundation for the next one. For the strategist, the best explanations are built on dead reef of prior conjectures.

A third characteristic of abductions is that they are presumptive. This means that future decision-making stages rely on them – we presume that our abductions are true. To illustrate, let's say problem solving proceeds in three steps: first, the problem is found; second, alternative solutions are developed; and third, the best solution is selected. Designers often play with many different solutions, but all of them are framed by how the problem was defined in the first place. This framing usually has a basis in abduction – that is, the problem statement itself is a guess, arrived at using the data which the strategist has at hand. Framing matters because the particular frames people use influence how they formulate problems, what alternatives they perceive, generate and attend to, which constraints they accept, reject, and/or manipulate and how and why they heed certain criteria rather than others in fabricating and implementing new solutions. In the market research example, the list of viable strategic responses to market growth depends on why you think the candy market is growing: is it really being powered by growth in retiree consumption? The strategist has to argue for the appropriateness of a particular response, arguments shaped by what is presumed to be the best explanation for the data.

Ultimately, abduction is a very pragmatic mode of reasoning. It is concerned with the practical need to take action, which motivates us to provisionally accept a hypothesis upon which we can base our next steps. Abduction allows the decision-maker to move forward in the absence of complete evidence or certainty. In business, the urgency to move forward – to make an assumption and ''go with it'' – is often high. There is just not enough time or resources to come to complete resolution: decision-makers have to make their best guess and move to the next stage of problem solving. Abduction helps us to act in the face of ignorance and uncertainty. Our abductions stand in for what we do not or cannot know. They allow us to get on with things.

## Where do abductions come from?

The stimulus for abduction is surprising information or a persistent anomaly: either of these phenomena can motivate us to start building (abducting) new hypotheses to explain them. However, compared to deduction and induction, how these stimuli lead to abductions is something of a mystery to psychologists, cognitive scientists and philosophers. We know how deduction and induction work well enough to be able to program it into computers. Computers are very good at inductive and deductive calculation, which involves a lot of logic and number crunching.

However, computers struggle to do abduction well. By comparison, people are lousy at logic and number crunching, but they are superb intuitive pattern recognizers. This pattern recognition is intuitive because the vast majority of it takes place at a subconscious level. In fact, cognitive scientists use a rule of thumb that at least 95 percent of brain activity is subconscious, and only 5 percent conscious[2]. Because abduction relies on these pattern recognition capabilities, this means most of the time people are not aware where their abductions come from. This is why the concept of abduction has always had an air of mystery about it and has been something of a black hole in the vast literature about reasoning.

Strategic decision making is no different. While many people know that abductions play an important role in strategic decision making, no one has been able to pin down precisely where abductions come from because the design of these new conjectures seems to be mostly hidden in the subconscious. Much of this activity may be multimodal, i.e. occurring visually as well as verbally. Because novel conjectures involve strategists drawing on a store of subconscious patterns that is a product of each individual's idiosyncratic life experiences, it should come as no surprise that abduction may be a rather subjective phenomenon: different people will tend to make different abductions (compare Holmes and Watson, for example). Also, given that experience ranges all over the place with much of it occurring at school, in the home, in leisure environments, etc., it should not be at all surprising that many abductions have some element of analogy in them. Patterns recognized in non-strategy environments will get imported into strategic decision making. And if much of this mental activity is subconscious, then individuals may not even be aware of the intuitive analogies they are using.

## Using abduction in strategy

Abduction gets used in thinking about a wide variety of strategic issues: explaining competitors' strategies, designing new business models, revising beliefs about the environment and identifying new market opportunities.

### *Using abduction to explain the strategies of competitors*

There is perhaps no realm where strategists make more wide-ranging guesses than in the realm of competitor behavior. What the strategist observes is data – the launch of new products, entry into alliances, the efforts to develop a new market, reports of plans to add capacity at some plants but not others, etc. Figuring out what is going on is like detective work. Explanations for competitor actions have to be guessed at. Therefore, generating hypotheses about the behavior of competitors is one aspect of strategic thinking where decision-makers rely heavily on abductive thinking.

Consider for a moment the onset of a price war between two competitors – say General Motors and Ford Motor Company. Who started it? Each accuses the other of ''firing the first shot'' and the observer has to abduce a hypothesis about who is telling the truth. Does it seem plausible that Ford, the smaller competitor, would assault General Motors, the larger and stronger firm? If it seems implausible, then we have at least shifted the burden of proof to one side, i.e. the abductive process leads us to look for stronger evidence that GM was innocent of starting the price war; we require less evidence from Ford.

The more general point about using abduction in competitor analysis applies to the assumptions we make about the motivation of competitors. We forget that many of the explanations we routinely offer for the behavior of competitors – profit maximization, executive hubris, pursuit of market share – are merely plausible guesses based on the data we have to hand. These guesses are defeasible and we drop them instantly if the data points to changes in motivation or the original guess just appears wrong. They are also classic examples of presumption because they frame the choices we go on to make about viable design solutions. So we use abduction extensively in explaining motivation. The catch is that we all too easily forget that these are only hypotheses. We can see actions; but we have to abduce motivation. And because the incentives for deception are sometimes great, we may make mistakes. We therefore need to exercise caution.

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### *Using abduction to design new business models*

Peter Drucker used to say that, for every business, managers have a theory of the business which is held either explicitly or implicitly. Nowadays we often refer to ''business models''. These models or theories are an important part of the strategic decision maker's toolkit because they are explanations of how the organization will make money or survive on its budget. In many ways they resemble the way architects and other designers use models as opportunities to play with alternative design hypotheses without actually breaking dirt. Particularly needed when business models are just forming (such as in emerging industries) or transitioning (during periods of industry transformation), the challenge is to come up with a good guess about what the underlying business model will turn out to be.

A good example of an abduced business model comes from Intel's use of Moore's Law. Moore's Law started life as an abduced hypothesis about the development path of semiconductors and later proved to be a good explanation for how a firm could make money in the chip business. Because the power of semiconductors doubles every 18 months, there is a predictable life cycle for every new semiconductor product that results in a predictable pattern of revenues and costs, i.e. a basic model on which the business is based.

Another interesting example comes from online grocery retailing. Take the case of Webvan. In July 1999, prominent venture capitalists Benchmark Capital and Sequoia Ventures placed a $122 million bet on internet grocer Webvan. In essence, they hypothesized that there was a viable business model for home-delivered groceries. This hypothesis was based on data from Webvan's launch period, including initial consumer response and data on the economics of delivering groceries directly to the home from large automated distribution centers. The hypothesis seemed entirely plausible at the time, but with hindsight we know that Webvan failed spectacularly and that internet grocery delivery models have seen very limited success in the USA.

### *Using abduction to revise beliefs about the environment*

In devising a new strategy for the future of their organization, the strategist has to start somewhere, even though their starting point may include several unproven or unverifiable assumptions about the environment. The strategist relies on plausible explanations of why the environment is behaving in particular ways. These hypotheses provide the logical framework within which strategic decision making occurs.

Belief revision is the process of adapting beliefs to accommodate new information. Abduction is one starting point for revising beliefs because revisions can only occur if the decision-maker is willing to consider at least one alternative hypothesis that might be true based on the data they take seriously. When strategists do not pay adequate attention to abduction, things can go very wrong. This is one explanation for what happened to Royal Dutch Shell in the Brent Spar affair. Shell managers were caught flat-footed by rapid changes in the stakeholder environment. In these circumstances, one of the first things these managers badly needed were the tools of abduction to help them begin to revise their diagnosis of their predicament and start designing their way out of their deteriorating situation. In some senses, abduction looks like a kind of real-time scenario planning: some fast abductions would have helped Shell managers rethink their strategic alternatives.

The main problem with belief revision is that new information may be inconsistent with the body of beliefs held by decision makers. These inconsistencies are especially high in times of dramatic environmental change. Therefore these are precisely the times that abduction

has its highest value. It is during periods of revolutionary change when the old patterns of data go up in the air that the strategist cannot rely on predictable continuity in the data. Instead, he/she has to get busy designing new hypotheses that plausibly explain what is going on. Based on these abductions, new strategies can be created.

### *Using abduction to find new market opportunities*

A fourth area of strategic decision making where abduction is used extensively is on the demand side. Here abduction is a reasoning method that may be used by decision-makers who seek out new opportunities to serve the market. The strategist sometimes conjectures or guesses at the emergence of some previously unobserved aspects of the market, such as new consumers tastes or trends in where and when consumers prefer to make their purchases. Based on data they collect about the marketplace – everything from large-scale market research projects to personal observations and intuitions – decision-makers formulate hypotheses about new market opportunities that might be exploited by their firms.

Good examples of this abductive approach to market opportunities can be found in the histories of major consumer goods companies. Take the well-known history of Proctor & Gamble's creation of the mass market for disposable diapers. For a long time, diapering was a strictly household activity. Then, in the 1930s disposable diapers were introduced but – being expensive – were a niche market (they were used for road trips where convenience was highly valued). In the 1950s P&G managers scrutinizing changes in household consumption patterns hypothesized that the market for disposable diapers might be a lot bigger than anyone had previously thought. They realized that an opportunity existed to convert the small niche market into a mass market if they could produce diapers at the price right. Thus ''Pampers'' was conceived. Not surprisingly, parents have never looked back.

In the case of Pampers, P&G's conjecture brought rich rewards, but many novel guesses about what market data are ''really'' indicating end in losses. When thought of this way, competitive markets provide an environment for testing conjectures. Changes in market data and their implications are ambiguous and strategists do better when they recognize that knowledge about tastes, technologies and resources is always to some extent conjectural – many plausible guesses about the market will turn out to be mistaken.

## Improving abductive thinking

If you are reading this and your job involves strategic thinking, by now you will probably have realized that abductive reasoning is an approach that strategists have been using all along. Many new strategies start with an abductive leap: some conjecture or hypothesis which explains a change in data about the environment. The strategist's initial task is to identify plausible explanations for what appears to be happening. These initial hypotheses then become the foundations on which strategic alternatives are designed and selected.

Abduction is key because the quality of your abductive reasoning processes can determine the quality of your design alternatives, and therefore the quality of your strategic choices. Novel thinking in strategy begins with novel hypotheses about the meaning behind the available data. Data about a situation do not speak on their own: they has to be deciphered, underlying patterns have to be guessed at, plausible hypotheses have to be conjectured. To design great strategies, strategists have to invest in the initial detective work that is done on the problem situation. Great designers have to be first and foremost great detectives who carefully study the evidence and then creatively conjure up the best explanation for ''what is really happening in the market'' or ''what our main competitor is really up to.'' Great strategic

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decision making relies in some important ways on abductive reasoning, even though much of the process of abduction is hidden in the cognitive unconscious.

If abduction is so key, how do we get better at it?

First, examine where you might get the most leverage from abductive thinking in your own strategy, such as explaining the behavior of competitors, designing new business models, revising beliefs about the environment and perceiving new market opportunities.

Second, we want to pass along a framework, derived from studies in artificial intelligence[3], for evaluating abduced hypotheses. It uses the following six criteria:

1. Consider how decisively your hypothesis bests alternative explanations. It is advisable to proceed boldly only when a hypothesis is decisively advantaged.
2. Consider how plausible your hypothesis is as an explanation of the facts by itself, independent of considering alternatives. Does it make sense given all the data you think are important? For instance, Moore's Law started life as a conjecture about the path of semiconductor development. One of the biggest things this hypothesis had to recommend it was that it was not contradicted by any data that were known about semiconductor development at the time. It therefore had the ring of plausibility about it.
3. Consider how much confidence you have that all plausible explanations have been canvassed. Make a judgment call: is it too early to have much confidence in your hypothesis or have you covered just about everything? For instance, the disposable diaper market had existed for two decades before P&G entered it and the firm had a lot complementary knowledge and data about emerging household consumption patterns based on other products they marketed. P&G had grounds to be reasonably confident in its hypothesis.
4. Consider the costs of being wrong and the benefits of being right; these influence when it is right for you to stop searching for alternative hypotheses and take your preferred hypothesis as the best explanation. In the case of Shell's debacle with the Brent Spar, given the stakes, was it sensible for Shell managers to have planned the sinking based on the hypothesis that Greenpeace would not react decisively? Shell's implicit hypothesis seemed to be that Greenpeace had not launched a major campaign for several years and its support base was dwindling. Shell failed to adequately examine the alternative hypothesis that the Brent Spar might present Greenpeace with an opportunity to revive itself, and that is exactly how Greenpeace used the situation. When there is a high price for being wrong, it is advisable to search a portfolio of hypotheses rather than chose the first plausible alternative.
5. Consider how reliable the data are on which your hypothesis is based. Take the case of Benchmark and Sequoia's bet of $122 million on Webvan. Although their hypothesis about emerging consumer trends was plausible, it was by far not the only reasonable hypothesis given the quantity and quality of the data available at the time. Venture capitalists know they are doing this – that is why they make a portfolio of bets rather than just one.
6. Consider how strong the need is to come to a conclusion at all. You might want to keep your options open by seeking further evidence before deciding on a hypothesis. If there is no strong need to reach a conclusion, consider whether new data sources might offer the opportunity to abduct new conjectures that might fuel the development of design alternatives in your firm.

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The message is clear: much of the practice of strategic decision making, rather like detective work, is less about ''knowing'' and more about ''guessing.'' Learning how to guess well – abductive thinking – is core to good designing.

## Notes

1. The philosopher Charles Sanders Pierce is credited with introducing the term abduction. For an accessible recent review of abduction, see Walton's (2005) book *Abductive Reasoning*. Other books

of interest are Magnani's (2001) *Abduction, Reason, and Science: Processes of Discovery and Explanation* and Josephson and Josephson's (1994) *Abductive Inference*. Harman's (1965) article ''Inference to the best explanation'' is also regarded as seminal.

2. See Lakoff and Johnson's(1999) *Philosophy in the Flesh*.
3. These criteria are based on Josephson and Josephson (1994, p. 14).

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