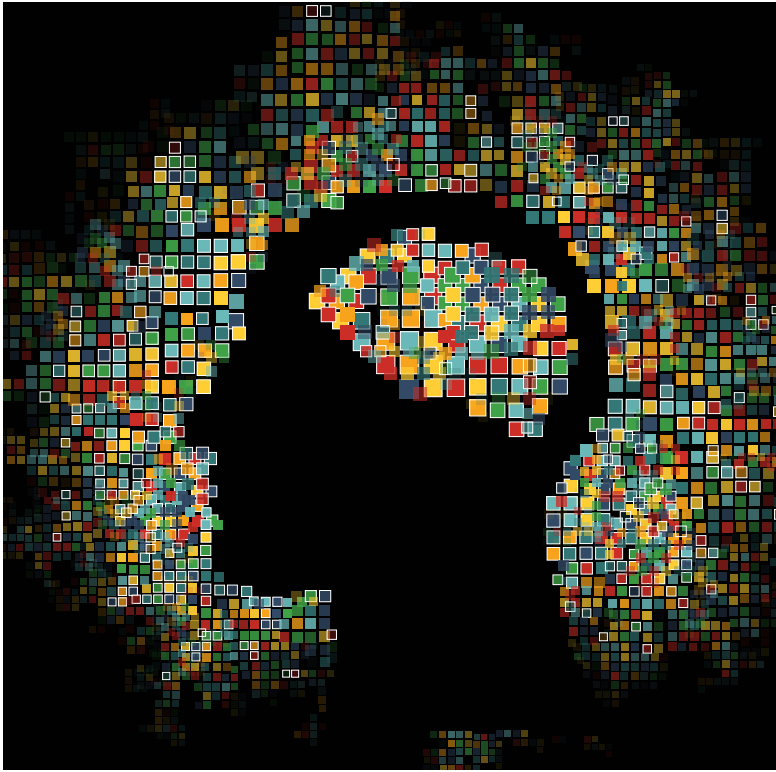


# How Cognitive Bias Undermines Value Creation In Life Sciences M&A



Life sciences mergers and acquisitions are typically based on perceived future value rather than objective financial parameters, but the cognitive biases inherent in subjective assessments can derail deals. Executives need to take emotion out of the equation and rely on relevant data to craft successful transactions.

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## BY ODED BEN-JOSEPH

Executives who evaluate their prospects based on a narrow, internally focused view relying on limited information and personal experience – rather than by consulting the statistics of similar cases – are prone to overestimate both their chances and degree of success.

This tendency to think narrowly about transaction strategies leads to a number of pervasive and severe biases in life sciences M&A transactions that routinely recur and too often lead to loss of momentum and the failure to get a transaction across the finish line.

So what? Substituting formal thinking, market-driven evaluation and analysis via analytical formulas for biased human judgment and intuition can go a long way to de-bias transactions, provide discipline and construct a framework to enable adoption of the outside view, thus leading to a greater chance for a successful M&A outcome.

**M**erger and acquisition transactions play a central role in the life sciences sector and are the catalyst for growth and transformation, driving innovation from the laboratory all the way to the patient. As I discussed in my August 2016 article, “Where the Bodies Lie” (*Nature Biotechnology*, 34, 909–911), life sciences companies often fall victim to recurring misconceptions that lead to unnecessary failure.

These failures often hinge upon management’s misunderstanding of the fundamentals of market and transactional dynamics. In particular, cognitive biases play a critical role, often leading to mistakes that are predictable and systematic. These biases disproportionately hinder the life sciences sector where, unlike other sectors, objective and measurable financial parameters such as revenue, earnings and margins play a minor role in determining company value as compared with scientific and clinical data. In other words, assets are sold based on their perceived future value, as opposed to a multiple of current revenues or earnings. The result of such biases is that management decisions are too often made emotionally, through distorted judgment, leading to reduced probability of closing a transaction that otherwise would be favorable to both buyer and seller. It is those biases that often stand in the way of closing – the emotional tail wags the rational dog.

### The External View Versus Narrow Thinking: Recurring Biases

A prevalent problem in decision-making is that executives form judgments based on incomplete and limited information that comes to mind or is readily available. Nobel laureate Daniel Kahneman coined the term “What You See Is All There Is” (WYSIATI) to describe the asymmetry between the way our mind treats information currently avail-

able and information we do not have.

When information is scarce, a common occurrence in life sciences M&A transactions, we tend to jump to conclusions. Narrow thinking, in which management focus their attention on one category or one objective, often shadows their ability to identify other categories or come up with more than one solution to a particular problem.

Executives seldom adopt an objective and statistical mind-set. When deciding to pursue an M&A route, boards and management typically take the inside view. They focus on the specific circumstances of their company and draw sketchy plans. They will plan an M&A strategy and make predictions about acquisition price and various other terms. Their point of view will be heavily dependent upon the information available to them as well as their personal judgment based on their individual experience – they will allow irrelevant images of the past and “unicorn-like” dreams of the future to shape their decisions. More often than not, management will be oblivious to the odds they face and fail to consider the enormous impact of the external world. However, if appropriate benchmarks are chosen, the outside view is likely to provide a fairly accurate indication on a realistic ballpark for a deal. Such benchmarks (base rate) are readily available but often ignored. Decision-makers are thus likely to commit a planning fallacy, where they will be unrealistically close to best-case scenarios and unlikely to remedy their predictions by simply consulting the statistics of similar cases.

Base rate neglect is just one of the biases we witness routinely in life sciences M&A deals. (See box for a list of common biases, and the sidebar, “The Most Common Cognitive Biases In Life Sciences M&A” for a more complete description of pervasive and severe biases that can derail M&A transactions.)

### Case Study

The following is a real-world example demonstrating how cognitive biases can profoundly undermine value creation and significantly reduce the probability of closing. In this example, failure to close is easily ascribed to a multitude of biases working in concert.

## COMMON BIASES

**Base rate neglect:** A prediction based on prior data and probabilities, absent of information specific to a particular case.

**Fallacy of small numbers:** Frequently, samples are too small to make any inference, but management is prone to jump to conclusions that have no bearing in reality.

**Narrative fallacy:** Explanatory stories that people find compelling are simple and concrete, but assign a larger role to talent, planning, rationality and intentions while neglecting the contribution of random luck, happenstance or serendipity.

**Optimism and overconfidence:** Executives often make decisions based on delusional optimism rather than rational weighing of gains, losses and probabilities.

**Illusion of control:** People overestimate their ability to control events and outcomes that they demonstrably have no influence over.

**Confirmation bias:** People seek data that are likely to be compatible with the beliefs they currently hold.

**Availability bias:** Decision-makers rely on knowledge that is readily available, rather than taking the effort to examine other alternatives.

**Affect:** Executive decision-making is often irrational and driven by intuition, gut and instinct.

**Endowment effect:** People ascribe more value to things merely because they own them.

**Anchoring:** People are typically over-influenced by a starting value, and their estimate stays close to the number initially presented.

**Sunk-cost fallacy:** The sunk-cost fallacy in M&A transaction comes into play when venture board members insist on valuations that reflect their overall investments in the company.



The board and management of a molecular diagnostics reference laboratory elected to sell the company to a strategic acquirer. While the company had a clear value proposition, a unique product offering and healthy year-over-year revenue growth, it was apparent that a partner with a substantial sales force was sorely needed to propel further growth. The board hired an M&A advisor to assist in these efforts. The advisor conducted a broad market landscaping analysis – the external view – in an effort to better understand the dynamics of the sector and, most importantly, identify key synergies and acquisition value drivers with potential buyers, as well as key risk factors, such as competitors’ entry into the company’s customer base. The advisor was also armed with relevant economic parameters including revenue and EBITDA multiples, industry margins and growth rates, and thus was able to estimate an expected transaction valuation and structure. Most importantly, the advisor had a good grasp of base rates of M&A transactions in the sector and, as such, was able to identify a number of key targets that could leverage the company’s value proposition and quickly integrate those toward rapid growth and profitability.

Although the CEO was reasonably knowledgeable, he constructed a narrative consisting of subjective interpretations, memories and emotions forming a perceived reality that existed only in his mind. The most pronounced biases exhibited by the seller were narrow thinking, overconfidence, illusion of control and narrative fallacy. The CEO rejected the advisor’s recommended strategy to embark on parallel discussions with multiple buyers, and he insisted on a linear process where discussions were conducted with one target at a time. This, of course, was not only time-consuming but it also was in direct opposition to the inherent nature of M&A transactions, where base rates are low. A base-rate neglect and an inability to adopt a statistical mind-set were thus rampant. The seller was also oblivious to the down-side risk and did not allow for a negative outcome where closing does not occur (a pre-mortem analysis would have been helpful, see below). The parallel approach is intended to create a healthy competitive

environment around the seller, facilitate organizational discipline and increase the probability to closing via the creation of alternatives as well as by filtering out the targets that are not likely to transact, while focusing on those that are.

**Assumptions**

Furthermore, the CEO always assumed that the company would be quickly acquired, again, neglecting the statistics, and constructed a story as to how the buyer would strategically leverage the company’s offering toward market expansion and revenue generation. He was overconfident about the acquisition price based on his perception of synergies and value creation of the combined entity, thereby committing an availability bias and a narrative fallacy. Moreover, the CEO selectively chose only a limited number of comparable transactions to justify his price expectation. He used the data for confirmation, not information, thereby subjecting himself to the fallacy of small numbers and confirmation bias.

Expectedly, the buyer had a different strategic point of view and also used different assumptions in its valuation models, resulting in an offer that was roughly 30% lower than the seller’s expectation (but in the ballpark of the advisor’s analysis). At that point, the seller was vehemently confident of its ability to change the buyer’s perspective toward a different outcome, thereby committing an illusion of control. The seller also failed to comprehend that, in private transactions, there is no such thing as the “right” price or fair market value. What a buyer ultimately pays is based on its views pertaining to the financial future value of the seller in his hands, including potential synergies and any changes that the buyer may make post-transaction. Thus, the inputs into a financial model to determine value, by definition, will be different from bidder to bidder, and these are different from the view of the seller, who sees its company on a stand-alone basis. The price paid will be “incorrect” for anyone but the buyer that closes the transaction. Lastly, when the buyer did not provide a premium to one of the seller’s non-revenue generating assets, the seller refused to acknowledge the sunk-cost fallacy.

**Three Strikes**

In search of a buyer who would confirm his beliefs, the proverbial “white whale,” these dynamics repeated sequentially with three additional buyers, two of which were major multinational players. In each of these, the seller was oblivious to the odds he faced, failed to allow for the unknowns and committed confirmation bias repeatedly. The buyers and advisor provided valuable market data, but the data were incompatible with the preconceptions and beliefs held by the seller. Interestingly, the four bids were remarkably close, within a 15% range. The seller also ignored this statistical fact. Predictably, momentum, which is crucial in getting a transaction across the finish line, was lost and after a prolonged period of time, board and management decided to abandon further M&A efforts, assume a significant operational risk and forego a healthy return on investment.

**De-Biasing Methods**

Substituting formal thinking, evaluation and analytical formulas for human judgment and intuition will go a long way to reign in some of the abovementioned biases and will provide discipline at the organizational level. Most importantly, they will provide a framework to enable adoption of the outside view, which will shift the focus from the specifics of the current situation of the company to the statistics of outcomes in similar situations, thereby minimizing bias. Below is a select list of de-biasing methods:

- 1. Adopt a statistical mind-set:** Adopt an outwardly, top-down, market-driven point of view. Shift the focus from your company to the dynamics of your sector. Identify appropriate benchmarks, obtain the statistics (the larger the database, the better) and use the statistics to generate a baseline prediction. Use these predictions as a starting point for further adjustments and assign values to possible outcomes and use information specific to your case to adjust the baseline prediction (but be aware of over-optimism, a significant source of error). Apply a variety of valuation methodologies such as comparable transaction, trading comparables, discounted cash flow, etc. When you have doubts about the quality

of evidence, let your judgment of probability stay close to the base rate.

**2. Create alternatives:** A particular problem often has multiple solutions. It is thus helpful to look at a given problem broadly from multiple perspectives and devise alternative solutions. Do not focus on a single scenario (you will overestimate its probability). Set up specific alternatives and make the probabilities add up to 100%. Avoid narrowly focusing on one possible solution. Having a good set of alternatives is at least as important as choosing wisely. Clear decision objectives should be defined when generating alternatives. Decision-makers are likely to generate more alternatives when decision objectives are considered one at a time, as opposed to all at once. By focusing on objectives sequentially and iteratively, decision-makers are more likely to gain a new perspective with each iteration of the alternative generating process, which in turn is more likely to generate a broad set of options covering multiple solutions.

**3. Create a simple algorithm, decision-making matrix or checklist:** It has been repeatedly demonstrated that an algorithm, even a simplistic one constructed on the back of an envelope, is often good enough to compete with an optimally weighted formula, and certainly good enough to outdo one's judgment. Linear models outperform expert judgment across a wide range of disciplines. The advantage of linear models is that they formalize the reliance on relevant decision-making criteria and minimize the opportunity for human biases. Related to quantitative models are checklists, which provide a simple tool for streamlining processes thus reducing errors. Specific criteria and action items in a list will allow the user to record the presence or absence of individual items to ensure that all are considered or completed.

**4. Conduct a pre-mortem analysis:** A pre-mortem analysis is a forward-looking exercise, rather than the backward-looking process of a post-mortem. We have all witnessed post-mortems where people point fingers or commit hindsight bias, the tendency to revise history of one's belief in light of what actually

happened, where they quickly construct a "coherent" story to explain failure – a cognitive illusion. Prior to committing to a decision, imagine that the outcome of that decision is negative and take the time to opine about the reasons for the negative outcome. This will overcome the groupthink that affects many teams once a decision is made, unleash the imagination of knowledgeable individuals in a much-needed direction, legitimize doubt and tame subjective overconfidence. The purpose is to identify vulnerabilities in the plan. This approach will also serve to curtail decision-makers' tendency to overestimate the likelihood of success and assist executives to better plan for different possible contingencies.

**5. Utilize your team:** Decision-makers have trouble seeing when their minds are misleading them but they can more readily see when other people are biased. A reliance on your team, supported by a culture of unencumbered intellectual exchange, coupled with training to question judgment, will serve to keep one another in check. Executives typically underutilize advice and overweight their own opinions at the expense of useful advice. Advice from others can assist decision-makers to overcome narrow thinking because a different person is likely to introduce a new perspective to a problem. As far as a formal process is concerned, it is more effective to elicit information by collecting each individual's judgment prior to running a public discussion. This approach makes better use of information available to members of the group and serves to diminish groupthink.

**6. Take time to reflect:** Check your thinking and ensure that you are not forcing the facts on an easy, coherent but ultimately false story. Upon reflection, management will be more likely to detect situations in which more careful reasoning is required. It will also serve to keep intuitive responses at bay. Most importantly, allow for intellectual agility and enjoy changing your mind.

**Conclusion**

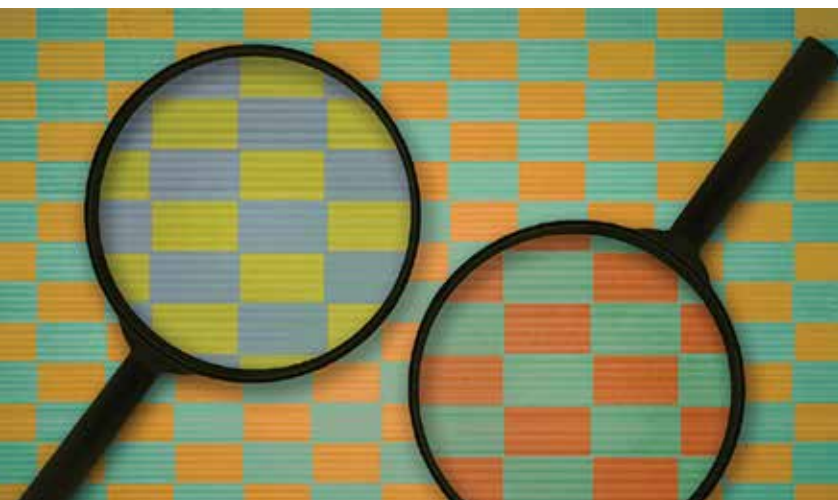
Human error is rampant and it is often difficult to tell the difference between knowing and not knowing. An unbi-



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ased appreciation of uncertainty is a cornerstone of rationality, but it is not what decision-makers often do. We have observed a recurring pattern in life sciences M&A transactions that centers around management's internal myopic view of a company, far detached from its segment dynamics. CEOs often focus on milestones, anchor their plans and neglect benchmark base rates, exposing themselves to the planning fallacy. Both in explaining the past and predicting the future, they overvalue the role of their skills and neglect the role of circumstance and luck thus exposing themselves to an illusion of control. They focus on what they know and neglect what they do not know, often unable to tell the difference, which result in overconfidence that their desired outcome will be achieved. Taken together, this pattern significantly reduces the probability of closing. The job of a decision-maker is to figure out the probabilities and respond to them with evidence-based reason, not emotion. Most executives in the life sciences sector have a highly developed ability to process and interpret data in an impartial scientific manner. This skill should be extended beyond science and into the external view. By adapting a formal strategy to decision-making and focusing on data germane to their sector, executives can minimize their exposure to cognitive biases. ▶

## THE MOST COMMON COGNITIVE BIASES IN LIFE SCIENCES M&A



### Base rate neglect

The base rate is a prediction based on prior data and probabilities, absent of information specific to a particular case. In transactions, the base rate is the likelihood that a transaction will close without considering the perceived probability of the specific transaction in mind. Statistical facts seldom come into consideration in decision-making. Instead, management tends to make big decisions based on little or no information and leap from little information to big conclusions. In our experience, management will almost always neglect to take the base rate into account and, as such, decisions are exposed to additional risk to closing. Base rates should be dominant in management's thinking and their beliefs should be constrained by the logic of probability.

### Fallacy of small numbers

A simple statistical reality is that large samples are more precise than small samples, and small samples yield extreme results more often than do large samples. Frequently, samples are too small to make any inference, but management is prone to jump to conclusions that have no bearing in reality. Executives often experience substantial difficulty adopting a statistical point of view and tend to imagine a causal connection between events. Given the central component of clinical data in life sciences transactions, management needs to engage in appropriate statistical reasoning and avoid falling into the trap of small numbers, thereby overvaluing, for example, Phase II clinical data of a small patient population. Similarly, when a transaction takes place at a particularly high valuation, it is important to acknowledge that it is likely an outlier, with little or no ramification on a particular company in the sector.

### Narrative fallacy

Good stories provide a simple and coherent account of people's actions and intentions. Narrative fallacies arise from our ever-present attempt to make sense of the world. Explanatory stories that people find compelling are simple and concrete, but assign a larger role to talent, planning, rationality and intentions while neglecting the contribution of random luck, happenstance or serendipity. These stories focus on the few known events that happened, rather than on the countless events that did not happen but could have caused a different outcome. In M&A transactions, however, reality emerges from the interaction of multiple agents and forces, random luck tends to play a role and the world is far less coherent and predictable than we would like to believe. As such, management is prone to overestimate the predictability of closing and fall victim into an illusion of understanding. It is thus wise to admit uncertainty, create multiple alternatives and address the downside risk of not completing a transaction.

### Optimism and overconfidence

The role of hubris and overconfidence in decision-making has been extensively researched. Unrealistic optimism is rampant in the life sciences as this industry selects for inherently optimistic innovators and entrepreneurs. The base rate five-year survival of small business in the US is 35%, but over 80% of entrepreneurs put the odds of success of their venture at 70% or higher. Thirty-three percent of entrepreneurs say their chance of failing is zero – a statistical impossibility. Executives often make decisions based on delusional optimism rather than rational weighing of gains, losses and probabilities. They tend to overestimate potential synergies and underestimate risk associated with the transaction. Unfortunately, the evidence counts for little in comparison to unrestrained confidence. The confidence that management has in their beliefs depends on the narrative they tell about what they see, even if they see very little. Executives often fail to allow for the possibility that the evidence that should be critical to their judgment is often missing. Inadequate appreciation of the environment inevitably leads to CEOs taking risks that they should avoid. The lesson here is that errors of predication are inevitable because the world is unpredictable. As Charles Darwin succinctly said: "Ignorance more frequently begets confidence than does knowledge." Thus, high subjective confidence should be treated with suspicion.

### Illusion of control

Illusions of control are common even in purely chance situations. It is the phenomenon in which people overestimate

their ability to control events and outcomes that they demonstrably have no influence over. Most of the founders and entrepreneurs that we encounter are convinced that the outcome of their company's efforts is largely dependent upon their actions. They tend to be oblivious to the fact that outcomes depend as much on random or external events as on a company's own efforts. This bias goes hand-in-hand with overconfidence and managerial optimism, all of which tend to have a negative impact on the decision-making process of senior executives in M&A transactions, consequently diminishing the probability of closing.

**Confirmation bias**

People seek data that are likely to be compatible with the beliefs they currently hold. One tends to see the world through a filter, noticing and looking for information that confirms existing preconceptions and ignoring data or evidence that contradicts them. This bias favors uncritical acceptance of improbable events, leading executives to fit the evidence to the theory rather than vice versa. They neglect data right under their nose, thereby distorting active pursuit of hard evidence and judgment. This bias transpires persistently and is a major obstacle in M&A transactions. One of many examples is when CEOs readily reject a buyer's point of view pertaining to valuations supported by various market-driven methodologies, such as comparable transactions, trading multiples and discounted cash-flow analysis, the latter of which is invariably a source of endless debate.

**Availability bias**

Decision-makers rely on knowledge that is readily available, rather than taking the effort to examine other alternatives. It is the process of judging frequency by the ease with which instances come to mind. Executives tend to take into account whatever facts they know, while neglecting facts they do not know. CEOs must make the effort to reconsider their beliefs and intuition by asking themselves whether their estimated valuation is supported by a broad benchmark well beyond their immediate knowledge base. This bias often coincides with both the fallacy of small numbers and overconfidence, leaving executives underprepared for M&A decisions.

**Affect**

A consistent misconception is that M&A transactions consist of a formal process where companies have a set of well-defined acquisition objectives derived from an umbrella corporate strategy, and that buyers and sellers will evaluate the target companies based on a detailed quantitative analysis toward a rational decision, devoid of emotion,

sentiment or self-interest. However, we often observe that executive decision-making is often irrational and driven by intuition, gut and instinct. This dominance of conclusions over arguments is most pronounced when emotions are involved. When people are favorably disposed toward a technology, a given for a sell-side life sciences CEOs, they rate it as offering large benefits and imposing little risk, which in turn, will fuel their overconfidence as to the successful outcome of M&A efforts.

**Endowment effect**

People ascribe more value to things merely because they own them. This is illustrated in a valuation paradigm where people will tend to pay more to retain something they own than to obtain something they do not own – even when there is no cause for attachment. The endowment effect violates standard economic theory, which asserts that a person's willingness to pay for a good should be equal to their willingness to accept compensation to be deprived of the good. This bias is apparent in M&A transactions where, by definition, sellers invariably overvalue their company (and buyers undervalue), regardless of objective data that points to the contrary.

**Anchoring**

People are typically over-influenced by a starting value, and their estimate stays close to the number initially presented although they do adjust that number to reflect new information or circumstances. Typically, however, those adjustments are insufficient relative to the initial number, thereby leading to an anchoring bias. Anchoring biases are most evident with respect to valuation and pricing of M&A transactions, particularly when buyers present a first offer, a negotiation advantage. Management should thus assume that any offered number has an anchoring effect and should mobilize to combat that effect by presenting arguments against the anchor.

**Sunk-cost fallacy**

A rational decision-maker is interested in the future returns of current investments. Justifying earlier mistakes or non-value-added activities is irrelevant. The sunk-cost fallacy in M&A transaction comes into play when venture board members insist on valuations that reflect their overall investments in the company. In many instances, common in the life sciences sector, past investments in endeavors that did not materialize and failed to create value are irrelevant. The continued commitment of resources to a failing project is a mistake and so is the expectation to garner value from a buyer.