These Ops Notes are from Mikhail (CC @Mike) our fellow Operator based in Moscow.

"Think Twice: Harnessing the Power of Counterintuition" by Michael J. Mauboussin

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Three steps process to avoid making cognitive mistakes:

1) Prepare - Know the categories of mistakes you can make.
2) Recognize - Have a skill of recognizing the problems in context (situational awareness).

Cognitive mistakes generally arise from the mismatch between the complex reality you face and simplifying mental routines you use to cope with that complexity.

3)Apply - Have a refined set of mental tools to cope with the realities of life avoiding making known types of mistakes.

Three factors that determine the outcomes of your decisions:

1) How you think about the problem.
2) Your actions.
3) Luck.

You should evaluate the quality of decisions based on an honest assessment of your thinking that went into solving the problem and your actions. Focus on the process of making the important decision, not on the outcome (Anything could happen and you need to be prepared for any outcome. Focus on the process of making your decisions and exploiting your edge and how to improve it).

Evaluate other people's decisions based on process rather than on the outcome to avoid being impressed by sheer luck and somehow attribute it to real skill.

The answer to most questions in life: "It depends".

Through evolution, human brains were shaped to quickly find predictive patterns in nature to increase human's chances for reproduction and survival. These quick mental shortcuts how to predict based on patterns are engraved in the process of functioning of our unconscious minds. And in our modern environment the same fast unconscious (Level 1 thinking) pattern recognition abilities that were so helpful in making decisions during most of the human history often trick us into making incorrect or even bad choices.

Mistakes #1(Ignoring outside view / ignoring base rate /ignoring apriori probability / Illusion of superiority/control/optimism) [Possibility of success drastically increase the perceived probability of success]:

The tendency to favor the inside view over the outside view, to use information that is close at hand and to make predictions based on that narrow and unique set of inputs(often anecdotal evidence and false perceptions) ignoring base rates and statistical data.

Examples: Overstatement of Big Brown chances to win the Triple Crown before last race, focusing on results of recent races and ignoring statistical data.
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Illusion of superiority (unrealistic positive view of themselves by people).

Note: Remarkably, the least capable people often have the largest gaps between what they think they can do and what they actually achieve.["Unskilled and unaware of it "]

["You must not *fool yourself* and you are the easiest person to fool." **(R.Feinman)**]

Illusion of optimism: Seeing own future as brighter than that of others.

Illusion of control: People behave as if chance events are subjects to their control.

All illusions bear a dangerous negative consequence in case of missed high expectations

Rule 1: People should tame their expectations. Either self-esteem of people will get hurt, people will try to create a narrative to deceit themselves(to avoid cognitive dissonance)(often by blaming someone or something else) or will act in a way that will exacerbate the negative consequences of missed expectations(double down doing the wrong thing).

The stories and narratives have a huge impact on the decisions we make. Edge can be found in finding compelling stories that don't stand a test by fact-based math(Great story but math paints a far less rosy picture, better completely different). **[Edge][First level thinking][Stories vs Math based evidence]**

Every compelling story should be tested based on the number's crunching to fact check it. (Though some stories are so powerful that they distort reality. Like Tesla's narrative.)

How to recognize:

Ask yourself, if there are similar situations that can provide a statistical basis for making a decision(base rate).

How to apply to yourself:

1)Find out a reference class / base rate / apriori probability / statistical evidence of success.

2)Then assess the distribution of outcomes (statistical rate of success and failure must be reasonable stable over time for reference class to be valid).

*3)Make your predictions based on this information and your inside knowledge(How to combine them see Base rate book by M. Mauboussin / also **[Bayesian inference]).***

In similar cases and situations and look what factors usually

*- led to failure to counteract them **[Inversion],***

*- what were the hallmarks of success to hone them **[Focus]***

*4)Assess the reliability of your predictions and fine-tune **[Feedback].** The worse the record of successful predictions is, the more you should adjust the predictions toward the mean(or other statistical relevant measure).*

*If you want to estimate how long it will take to complete some project - look for statistical evidence what time it takes for other people to complete similar projects.***[Base rate]**

How to apply to others:

*-Look for overconfident people / organizations that are blind sighted by their huge egos or short term success that was largely due to luck and bet against them based on mean reversion ["Spot the suckers and bet against them."][Fat Tony's Bet]****[Mean reversion]***

-Compelling stories should be tested based on numbers crunching to fact check them. If there is a disparity between the story's narrative / predictions and what math based on sound assumptions is saying then take the side of math. ***[Edge][First level thinking][Stories vs Math based evidence]***

- If you want to sway decisions of others then tell them compelling story(anecdote), that will create a vivid image in their minds which will influence their preferences ***[Presuasion].***

Mistakes #2 Insufficient consideration of alternatives /Tunnel vision (Anchoring, representativeness bias, availability bias, naive extrapolation)

Examples: **[Anchoring]**

Even if experiment is running right after explaining the concept the bias still can be observed. Psychologists believe , that anchoring is predominantly subconscious.

People fail to consider what they believe is false.

Anchors more strongly influence the decisions in situations with limited information or uncertainty. Party that makes the first offer (create an anchor) often benefits from an ambiguity of the situation.

-To counteract anchoring bias you should develop and recognize full range of possible options / outcomes.

[Framing]

Problem' s presentation strongly influences how and what we choose. [Framing bias]

- To counteract it state the problem in as many ways as possible.

[Mental Models and Abstractions]

(Mistake of investors during CDO crisis: If some bond has AAA rating the chances of it going bankrupt is nonexistent)**[AAA subprime mortgage bond fallacy]**

People have their own mental models of reality, which trades speed of processing for complete representation of reality. Ill-suited mental model will lead to decision fiasco. **[Trade-offs][Green lumber fallacy]**

[**Representativeness bias**: "Judging books by their covers", making decisions based on representative categories in your mind]

(Making diagnoses based on common/most wide spread illnesses without properly consider the individual case / Not attempting to think of some less probable reasons for illness that are rare for the individuals in category to which the patient seemingly belongs)

-Don't make decisions without considering atypical alongside with typical answers / solutions.

[**Availability bias** - judging frequency or probability of event based on what is readily available in memory]**[Affect]**:

- Be aware of situation in which you want to make a decision based on some recent information without considering historical information / base rates.

[Tendency to extrapolate from past results, recent past / failure to reflect reversion to the mean]**[Naive extrapolation]**:

- Know the base rate; explore how recent results correspond with historical results

[Cognitive dissonance / Desire to be internally consistent]

(Story of Kurt Wise is a good example - paleobiologist that tried to cut out all nonsensical information from Bible in order to make the text scientifically infallible and failed. And then he decided to ignore the scientific evidence and turn to the religion.)

-Be aware that some people just can't stand the evidence and scientific facts contradicting to their beloved ideas. It is futile(waste of time and energy) to attempt to change their beliefs.

- Treat your own ideas and models as current version of your mental software. [E. Musk's idea]

In that way it is seemed beneficial to upgrade your views when "better version" becomes available.

Always try to find new better working ideas, but the process of "updating" should be based on scientifically proven and tested ideas.

Consider carefully ideas that contradict your views, ask yourself how they can help to improve your mental models. [Critics seeking behavior]

"The only thing that should be consistent is your desire to think better and become a better person."

[Confirmation bias / desire to be externally consistent]

(Individual seeks information that confirms a prior belief or view and disregards or disconfirms evidence that counters it / People are selective in their exposure and retention)

Example: fMRI Study of brains of political partisans, that easily view inconsistency and contradictions in a speech of opposing party candidate but fail to notice them in a speech of their party candidate. The brains emanated positive feelings, when the information that were presented coincide with their beliefs.

Consistency has two benefits:

1)It permits us from thinking about the situation (avoid thinking)

2)It frees us from need to change our behavior(avoid acting)

-- Increase your own exposure to diverse ideas .

--Never reject idea before carefully thinking about it and reasons why other people find it plausible. What this idea can tell you about people who believe in it? Can it help you to predict their future behavior? Try to put yourself in others peoples shoes, view the situation from their standpoint.

Question the key assumptions, look for contradicting evidence.

[Tunnel vision / Fail to consider alternative views, explanations]

Two factors mainly contribute to it:

1)Finite attention bandwidths [cognitive limitations].

2)Stress (Chronicall stress debilitates our minds and bodies. Humans were prepared evolutionary to have rare quick bursts of stress followed by long stress free periods. Stress response to the psychological stress is the same as to physical stress. Chronicall psychological stress debilitates our minds and bodies (it physiologically impairs digestive, growth, regenerative, immune, reproductive and cognitive systems)[Robert Sapolsky].

Stress forces people to think short term which is usually not a best option in our current environment.

- Avoid or try to minimize impact of chronicall psychological and physical stress:

Meditate

Have a consistent sleeping schedule and sleep regularly 7-8 hours

Work steadily to make tasks well ahead of deadlines

Regularly play sports (short term physical stress is beneficial for health)

Regularly spend more time in nature (parks, forests, etc)

Have a strong social support (family, friends, community)

Have an overarching purpose(s)

Be regularly involved in something that makes you feel happy

Avoid toxic people, especially those that try to displace their stress on you (stress displacement is an effective stress reducing strategy for animals and for humans alike)

Carefully think about outcomes of your decisions to avoid being put in jeopardy in the future (think and plan long-term)

Think about risks and possible sources of problems before making decisions and taking actions (Better have a checklist for it to avoid missing some important question that can help you to spot the problems ahead of time)

[The Power of Incentives]

Example: Choice between two types of operations on the conference of surgeons. Surgeons voted to recommend more difficult and expensive type to unknown patient but chose other type if the patient would have been their wife.

Incentives have tremendous power over the choices and decisions of individuals. The biases that come with incentives are often subconscious.

- Always consider what choices the system of incentives encourages .What motivates people and what are the ways in which they can achieve what they want.

How to apply to yourself:

1) Explicitly consider alternatives - frame the problem in different ways / don't settle down after first seemingly pleasing solution. Know the Best Alternative to the chosen solution. ***[BATNA]***

(For negotiations talks :Know best alternative to negotiated agreement, your walkaway price and estimate the same sums for the party across the table).

2)Seek dissent / Seek discomforting information

Ask the toughest questions /Be the toughest critics of your own ideas

Look for reliable sources that offer opposing conclusions

Surround yourself with people that have dissenting views(to avoid groupthink, social proof tendency and confirmation bias)[A. Lincoln embodied that approach]

Have a desire to find better working ideas and techniques ***[Kaizen]***

3)Keep track of your previous decisions through decisions journal to avoid ***[hindsight bias].***

Write down rationale and predictions for every important decision, revisit the writings regularly.

4)Avoid making decisions while at the emotional extremes / under outside stress.

To do it make all important decisions after a good sleep (emotional state normalizes during sleep), before making decision prime yourself with image / writings of some wise decision maker.

5)Have a checklist wherever possible with questions that can help to avoid cognitive mistakes.

6)Understand incentives. What incentives exist and what behavior can they motivate in yourself and others.

How to apply to others:

- Always consider what choices the system of incentives encourages (What motivates people and what are the ways in which they can achieve what they want). Outcomes are largely consequence of incentives system.

- Be aware that probability of mistakes increases when someone is put under stress, especially when they go through a stressful period without a proper sleep.

- Low-ball(ask for something trivial then after some time ask for what you want)and leg in the door(ask for something too generous then immediately go back to what you really want ***[reciprocation])*** *techniques that helps to exploit people's tendency to be consistent.*

- If you want to instill some idea in someone, you should structure your pitch in such a way that the person should come to the idea by themselves, to treat the idea as their own. ***[Indirect reach]***

-Present anecdote, story that can be easily visualized and remembered to make it easily available when person will make relevant decisions. ***[Affect]***

-Frame the problem, question in a way that should led for a person to an answer you want them to reach ***[Framing / Indirect reach /Consistency]***

-If you want to sway a person's decision in one direction, preclude the question with anchoring information. ***[Presuasion]***

Mistakes #3 Use experts' opinions instead of mathematical algorithms or wisdom of the crowds; inappropriately rely on intuition ; make mismatch mistake

Most people have trouble incorporating broad statistical evidence into judgment at hand.

Knowing when to look beyond experts requires a totally fresh point of view and one that does not come naturally.

1)First, consider the type of problem you face.

Domain description	Rule based :limited range of outcomes	Rule based : wide range of outcomes	Probabilistic; Limited range of outcomes	Probabilistic; Wide range of outcomes
Expert performance	Worse than computers (Use mathematical algorithms(e.g. regression))	Generally better than traditional computer models but new AI architectures has already overcome humans in a lot of such domains(2018) (Use advanced AI based advice)	Equal or worse than current AI architectures, sometimes worse than collectives (Use AI advice, incorporate wisdom of the crowds)	Worse than collectives (Use wisdom of the crowds , prediction markets)
Expert agreement	High	Moderate	Moderate	Low
Examples	Credit scoring	Go Film, book recommendation	Poker; Admission officers	Stock market; Economic forecasts

2)Turn to the best method for solving the problem based on the type of the problem.

[Wisdom of the crowds]

Diversity prediction theorem:

Collective error = average individual error - prediction diversity

(errors stated in terms of squared errors)

collective error is the difference between the correct answer and the average guess

average individual error measures accuracy of individual guesses

prediction diversity measures the dispersion of guesses , or how different they are

Three conditions should be in place to make it work:

1)Diversity (reduces collective error)

Most likely to be violated due to social influence and imitation.

[**Information cascades** phenomenon - when people make their decisions based on the actions of other people, rather than on their private information]

[**Group think** is an example of diversity breakdown in small groups - views of people within group become homogeneous after they spent some time within the group]

2)Aggregation (assures that everyone's information is considered).

3)Incentives (encourages people to participate only when they think they have insight).

Diverse crowd will always predict better than the average person in the crowd.

But when one or more conditions are violated the collective mistakes can swell.

[Inappropriately relying on intuition]

Intuition works well in stable environments where conditions remain largely unchanged, where feedback is clear and cause-effect relationships are linear.

Intuition doesn't work with changing system and in complex nonlinear situations , where there are tough or impossible to find linear cause-effect relationships and tough or impossible to have a meaningful feedback.

[**Mismatch problem** : using measures to estimate future performance that have no predictive value]

Example: Relying on tests for young athletes to predict their future career success.

Educational credentials are poor predictors of future performance.

Job interviews and future performance on the job.

How to apply to yourself:

1)Determine the type of problem and match it with the most appropriate way(ML algorithm, wisdom of the crowds mechanism)to solve it.

2)Seek diversity, widen the range of possible views on the problem. Seek for group of intelligent people that have different opinions different to your own.

3)Use technology when possible, search for relevant data samples and applicable algorithms.

How to apply to others:

1)Be alert of inadequate use of experts opinions, data that has no predictive value, predictive models that are not suited for solving particular type of problem (Always ask what is a correct way to solve such type of problems). If you will find such situation, you should figure out appropriate way to solve the problem and find a way to bet on the discrepancy between the predictions of the models.

Mistakes #4 Not paying proper attention to the situational circumstances and factors that unconsciously influence our decisions

Examples:

[Conformity] Asch - Berns studies of conforming behavior in group settings, that using fMRI have found that group choices changes perception of individuals(activity in the brain regions that are responsible for mental rotation was registered, while there wasn't meaningful change in activity of frontal lobe) ,literally "seeing is believing what the group tells you to believe" . And those who didn't conform experienced increased activity in amygdala (emotional center that is activated when rapid actions are needed (fight, flight, feed and f..fornicate)). So it was unpleasant experience for them.

[Fundamental attribution error] - tendency to explain behavior based on individual's disposition versus the situation. Explaining behavior of others by qualities of their characters and explaining own behavior by influence of circumstances. Interestingly, Easterners provide more situational explanations that Westerners.

[Priming]Playing German music in a wine store made people select German wines 73% of the time, when French music was playing people selected French wines 77% of the time. They didn't recognize consciously ,that music influenced their choices so strongly. Words, smells, sounds, visual backgrounds are capable to influence decisions. For priming to work, the association must be sufficiently strong and the individual must be in a situation where the association sparks behavior.(Very actionable)

Want to sell something expensive - prime people with environment that is associated with status, comfort, sexuality, pride.

Want to make people behave more prudently and rationally - prime them with environment that is associated with good decisions, numbers, money.

Want to make people behave in more relaxed fashion - prime them with relaxing music, soft furniture, funny pictures, familiar to them relaxing environment.

Want to make people behave better towards each other - prime them with preaching, sermon, reading sacral texts that praise good behavior and promise to punish bad behavior.

Want to make better decisions - prime yourself with images of great decision makers and their wise words.

Want to increase motivation and tenacity - prime yourself with motivational music, images that are associated with achieving goals and focused work, images of people who have achieved their goals through practice, tenacity and hard work.

[Status quo bias / tendency to chose default option or don't make a choice if possible]

+ [Framing]

Countries with similar cultures (like Austria(almost 100%) and Germany(12%), Sweden(86%) and Denmark(4%)) have huge disparity in percentage of people that give their consent for using their dead bodies(in case of car crash, etc) for organ donations. In high participation rate countries you must opt out of the program , while in low participation rate countries you must opt in to become a donor.

*Frame the question, offer in such a way that is beneficial for you by making preferable choice the default option, make it effortless for people to make a decision you want them to make.**[Choice architecture]***

*Be aware of such techniques used on yourself. Reframe the questions and offers. Think about the decisions from first principles. Find the right level of abstraction for viewing the problem - not missing any important information and not being distracted by the details irrelevant for the decision**[avoid Green lumber fallacy]***

[Affect] Relying on immediate emotional reactions to visualized risk or benefit instead of impartial judgment of probability of future outcomes (Possibility distorts perception of probability).How we feel about something influences decisions - one of the most dangerous emotional mistakes in investing/trading. Affective responses occur quickly and automatically, are difficult to manage and remain beyond our awareness.

Have a checklist to avoid making emotional decisions.

Make important decisions when mind is fresh. (in the morning /and never in the evening or when tired)

Sleep over the important decisions : Think about some choice thoroughly then sleep then make a decision.

Don't make important decisions when you are under the influence of emotions or stress.

To make more prudent decisions start considering risks first, before the benefits to avoid being mesmerized by the possible positive outcome.

Track emotional states of other people to propose deals/choices to them at the right time, when they feel optimistic and are in good mood.

To increase chances of accepting the offer by other people help them to visualize positive outcomes by using vivid examples and pictures, then they will pay less attention to the probability of positive outcome. (Isn't that what E. Musk has achieved?)

[Tendency to obey to authority]

Stanley Milgram experiment is vivid example of such behavior - people in the experiment obediently inflicted astounding amounts of pain to other people under the commands of authority.

Question every order that someone try to make to you. Never do anything without thinking about it for yourself, use your own judgment.

[Tendency to obey the situational rules and play the role / Lucifer effect]

Philip Zimbardo Stanford Prison experiment illustrates this tendency - people who became "guards" in the experiment abused the "prisoners" and tried to make them miserable. Zimbardo was forced to end it after just 5 days (Boy, that escalated quickly!)

Rules can create a means to dominate others and simultaneously allow people to justify their hostile behavior as only conforming to the rules.

In situations that lead to negative behavior there is often an enemy - an outside group.

Be mindful of what is going on around you. Don't take rules for granted.

[Resistance to change / Inertia]

Individuals and organizations perpetuate poor practices even when their original usefulness has disappeared and better methods have surfaced.

Ask the question "If we didn't do it already, would we, knowing what we now know, go into it?"[Zero-Based Budgeting]

Use checklists to always follow the necessary steps, drastically decreasing probability of overlooking some important information or procedure.

1)Be aware of the situation / circumstances / context.

Create a positive environment for decision making in your own surroundings by focusing on process, keeping stress to an acceptable level, being a thoughtful choice architect and making sure to avoid making decisions under influence of negative forces (psychological nature).

Be aware of what can influence your decisions, experiment and find optimal conditions, avoid making decisions in conditions that negatively influence the quality of your decisions.

2)Consider the situation first and the individual second [attributional charity]

3)Watch out for institutional imperative - mindless imitation of peers at doing.

4)Avoid inertia.

Periodically revisit your processes and ask how can your improve them given new information, changes in environment or changes in the purpose of doing it in first place.

Use checklists to avoid error of overlooking something or not being rigorous enough in doing something.

How to apply it to yourself:

[Priming]

Want to make better decisions - prime yourself with images of great decision makers and their wise words.

Want to increase motivation and tenacity - prime yourself with motivational music, images that are associated with achieving goals and focused work, images of people who have achieved their goals through practice, tenacity and hard work.

*Be aware of framing techniques used on you. Reframe the questions and offers. Think about the decisions from first principles. Find the right level of abstraction for viewing the problem - not missing any important information and not being distracted by the details irrelevant for the decision**[avoid Green lumber fallacy]***

[Affect avoidance]

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Don't make important decisions when you are under the influence of emotions or stress.

To make more prudent decisions start considering risks first, before the benefits to avoid being mesmerized by the possible positive outcome.

[Avoid authority misinfluence tendency]

Question every order that someone try to make to you. Never do anything without thinking about it for yourself, use your own judgment.

Be mindful of what is going on around you. Don't take rules for granted.

[Resist Inertia]

Ask the question "If we didn't do it already, would we, knowing what we now know, go into it?"

Use checklists to always follow the necessary steps, drastically decreasing probability of overlooking some important information or procedure.

How to apply it to others:

[Priming]

Want to sell something expensive - prime people with environment that is associated with status, comfort, sexuality, pride.

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Want to make people behave in more relaxed fashion - prime them with relaxing music, soft furniture, funny pictures, familiar to them relaxing environment.

Want to make people behave better towards each other - prime them with preaching, sermon, reading sacral texts that praise good behavior and promise to punish bad behavior.

*Frame the question, offer in such a way that is beneficial for you by making preferable choice the default option, make it effortless for people to make a decision you want them to make.****[Choice architecture]***

[Affect]

Track emotional states of other people to propose deals/choices to them at the right time, when they feel optimistic and are in good mood.

To increase chances of accepting the offer by other people help them to visualize positive outcomes by using vivid examples and pictures, then they will pay less attention to the probability of positive outcome.

Mistakes #5: Using linear models and reductive models in dealing with complex nonlinear systems; focus on isolated part of a complex adaptive system without appreciation of system dynamics.

Complex adaptive system has three parts:

1)Group of heterogeneous agents.

2)Agents interact with each other and through these interactions structure emerges **[Emergence]**

3)The emergent structure has properties and characteristics that are distinct from those of the underlying agents themselves.

[Ant's colony, Bee's swarm]

Complex adaptive systems often perform well at the system level, despite dumb agents (a point that both scientists and nonscientists often fail to grasp). Conversely, unintended consequences can lead to failure when well-meaning individuals attempt to manage the system to achieve a particular goal.

If you want to understand the colony , don't ask the ant **[avoid Green lumber fallacy][Reductionism approach will not work]**. Study the colony.

[Mistake of Extrapolating individual behavior to explain collective behavior]

By studying the market, we can get a much better sense of how various decisions affect economic value than we can by listening to partially informed individuals.

This mistake also shows up in behavioral finance, a field that considers the role of psychology in economic decision making. Market irrationality does not follow from individual irrationality.

In dealing with systems, the collective behavior matters more. You must carefully consider the unit of analysis to make a proper decision.

[Addressing one component of the system can have unintended consequences for the whole]

Examples of miserable experience of people that tried to manage complex ecosystems without regard to second level effects are abundant. (Australia, Yellowstone National Park)

Think about second level effects of actions that are intended to change something in complex system.

[Domino principle]

[Mistake of isolating individual performance without proper consideration of the individual's surrounding system]

We tend to overstate the role of individual in successes. Hence the recurring overpayments by companies to recruit star performance from other firms. Employers underestimate the systems-based advantages that prior employer supplied, including firm reputation, resources, relationships that supported previous success, the quality of other employees, the familiarity with processes.

What to do:

1) Consider the system at correct level [Avoid Green lumber fallacy].

Be aware the function of individual agent within the system may be very different from that function outside the system.

2)Watch for tightly coupled systems (all parts of the system are needed for it to function properly, hence higher probability of failure) (that is a tough task).**[Multiplication by zero]**

3)Use **[simulations]** to get some insights about behavior of complex adaptive systems. Set up a system that models the actual system, give rules to individual participants and see how they will behave in system's settings. ["The Beer Game"]

“Understanding how well intentioned, intelligent people can create an outcome that no one expected and no one wants is one of the profound lessons of the game.”

How to apply it to yourself:

*Think about what is the right level of abstraction for viewing the system that can provide useful and actionable insights about its behavior. You should not miss any important information and should not be distracted by the details irrelevant for the decision****[avoid Green lumber fallacy]***

*Think about second level effects of decisions and actions. It is from this insights analytical edge can emerge and allow you to profit from it. **[Second level thinking]***

Mistakes #6 Failure to properly consider the context

The right answer to most questions that professionals face is , "It depends".

Once you realize the answer to most questions is “It depends”, you are ready to embark on the quest to figure out what it depends on.

You should be highly skeptical any time you see "the keys to success" or "formulas for winning".

[Mistake of embracing a strategy without fully understanding the conditions under which it succeeds of fails]

Example: Boeing unsuccessful attempt to outsource production of Dreamliner. Outsourcing does not make sense for products that require the complex integration of disparate subcomponents. The reason is that coordination costs are high, so just getting the product to work is a challenge.

Outsourcing does make sense for industries where subcomponents are modules. In these cases, the performance of the subcomponents is well defined, and the final assembly is straightforward.

Before using / embracing some strategy, answer the question why it has worked previously, what factors are the same and what has changed.

[Failure to think properly about competitive circumstances]

[Colonel Blotto game as a model how to think about competitive games with multiple dimensions -

players should allocate resources on multiple fronts, winner is a person who won higher number of fronts; front is won if a player has more resources on that front]

The more dimensions the game has, the less certain the outcome (unless the players have identical resources). For this reason, the outcome is harder to predict in a high-dimension game than in a low-dimension game, and as a result there are more upsets.

Example: Baseball is a good example of a high-dimension game. While the better team has an edge, the outcomes include a large dose of randomness.

The Colonel Blotto game is also highly nontransitive in all but largely asymmetric, low-dimension situations.

The stronger player wins most battles against the weaker player if the dimensionality is low.

With equally matched players, the number of suboptimal strategies rises as dimensions increase, because the players risk lumping resources in a few battlefields and thereby leaving a large number of battlefields without resources.

But increasing the number of dimensions also dilutes the relative strength of the high-resource player.

What is perhaps the most important lesson from the Colonel Blotto game is that *you must be circumspect in evaluating decisions and outcomes. Because of nontransitivity and randomness, the attribute of resources does not always prevail over the circumstance of dimensionality. In a complex game, the best man doesn't necessarily win.*

If competitor has more resources then you should increase the number of "fronts / dimensions" to increase your chances for win.

[Failure to distinguish between correlation and causality]

This problem arises when researchers observe a correlation between two variables and assume that one caused the other.

Examples: Vegetarians have higher IQs(People that have higher ability for self control(more developed prefrontal cortex) have higher IQ and higher ability to stay on a restricting diet). Nightlights lead to

nearsightedness (reading is causing both). Kids who watch too much television tend to be obese(low socioeconomic status is causing both).

Three conditions must hold to make a claim that X causes Y.

1)X must occur before Y.

2)Functional relationship between X and Y. X should increases chances of Y and the relationship shouldn't be merely happenstance.

3) For X to cause Y, there cannot be a factor Z that causes both X and Y.

Every causal connection you encounter should be viewed through the lenses of these conditions. The task is to force your brain to search for disproving evidence.

[Inflexibility in the face of evidence that change is necessary]

Example: Failure of Norse settlers in Greenland (900 -1300) to adopt their livelihood to challenging circumstances (they cut too many trees, stripped turf to build homes, allowed overgrazing, failed to fish, didn't learn how to hunt whales and ringed seals from Inuits).

Mistake of perpetuating outdated practices and refuse to embrace new best practices in rapidly changing world is a very costly one. ["Not invented here syndrome"]

Always try to improve your models and tools for making decisions and acting, embrace the positive change. Have a growth mindset. Treat ideas and models as a tools, not as a part of your identity. If some practice, model, idea is better than that you currently hold based on objective criterion ,than adopt a better one!

What to do

1) Ask whether the theory behind your decision making accounts for circumstances.

Read Thomas Thurston and Clayton Christensen on the subject of how to distinguish between viable business plans and those that are destined to fail.

2) Watch for the correlation-and-causality trap.

Every causal connection you encounter should be viewed through the lenses of 3 necessary conditions for causality. The task is to force your brain to search for evidence disproving causality.

3) Balance simple rules with changing conditions.

4) Remember there is no “best” practice in domains with multiple dimensions.

How to apply it your yourself:

Think what factors of a situation influence the solution you want to find. What does the solution depend on?

Before using / embracing some strategy, answer the question why it has worked previously, what factors are the same and what has changed.

You must be circumspect in evaluating decisions and outcomes. Because of nontransitivity and randomness, the attribute of resources does not always prevail over the circumstance of dimensionality. In a complex game, the best man doesn't necessarily win. Remember there is no "best" practice in domains with multiple dimensions.

If competitor has more resources then you should increase the number of "fronts / dimensions" to increase your chances for win.

Every causal connection you encounter should be viewed through the lenses of 3 necessary conditions for causality. The task is to force your brain to search for evidence disproving causality.

You should always strive to improve your models and tools for making decisions and actions, embrace the positive change. Have a growth mindset. Treat ideas and models as a tools, not as a part of your identity. If some practice, model, idea is better than that you currently hold based on objective criterion ,than you should adopt a better one!

How to apply it to others:

If an organization or group of people used to some model which works fine in some specific circumstances and if they are not nimble and too entrenched in thinking through the lenses of this model, you should watch out for changing circumstances that make the model obsolete and bet against them. [Fragility and Antifragility] [Exposure to negative convexity]

Mistakes #7 Disregarding phase transition effects, thresholds, critical points.

Positive feedback leads to outcomes that are outliers. And critical points help explain our perpetual surprise at black swan events because we have a hard time understanding how such small incremental perturbations can lead to such large outcomes.

The presence of phase transitions invites a few common decision-making mistakes. The first is the **[problem of induction]**, or how you should logically go from specific observations to general conclusions. Induction (naive extrapolation) fails miserable in systems with phase transition.

Dealing with a system governed by a power law is like the farmer feeding us while he holds the axe behind his back. If you stick around long enough, the axe will fall. The question is not if, but when.

Repeated, good outcomes provide us with confirming evidence that our strategy is good and everything is fine. This illusion lulls us into an unwarranted sense of confidence and sets us up for a (usually negative) surprise. The fact that phase transitions come with sudden change only adds to the confusion.

To understand the phenomenon, better to focus on falsification than on verification. And it is unnatural thing to do.

Estimate the nature of phenomena, things and people on the scale of fragile - robust -antifragile. Estimate the nature of impact caused by changes in some critical parameter. If the magnitude of the negative impact accelerates with changes in parameter than the system is fragile.[Fragile and Antifragile][Negative and Positive convexity]

[Reductive bias] a tendency for people to treat and interpret complex circumstances and topics as simpler than they really are, leading to misconception.

Example: Use of simpler but wrong price-change distribution has led to blow up of Long Term Capital Management.

Use Gaussian copula formula that deal with the challenge of measuring the correlation of default between assets was one of the factors that led to huge losses incurred by financial institutions in 2007-2008.

It demonstrated that asset price changes were much more extreme than previous models assumed (and still a lot of the market participants are operating based on the flawed models). While the market's wild randomness was there for all to see, Mandelbrot said, economists stuck with mild randomness, in large part because it simplified the world and made the math more tractable.

[Belief in forecasts and predictions mistake]

Example: Music Lab study (10 "worlds" with the same songs in each and zero initial downloads produced different patterns of popularity, top-five song in independent world had about 50% of finishing in top-five in social influence worlds) showed that **in systems with social influence small differences in initial conditions lead to dramatically different outcomes.** In the eight social worlds, the songs the subjects downloaded early in the experiment had a huge influence on the songs subjects downloaded later. Since the patterns of download were different in each social world, so were the outcomes.

Social influence tends to exacerbate product successes and failures, leading to extremes.

Flexibility decreases over time - for the social worlds, the outcomes stabilized after about one-third of the subjects participated.

How to deal with a systems that have phase transitions:

1)Study the distribution of outcomes for the system you are dealing with. The key is to properly prepare for whatever outcome the system capable to produce.

The best course is to recognize the nature of the distribution and to prepare for all contingencies.

Recognize the nature of phenomena, things and people on the scale of fragile - robust -antifragile. Estimate the nature of impact caused by changes in some critical parameter. If the magnitude of the negative impact accelerates with changes in parameter than the system is fragile.

2)*Look for critical point moments*. Lack of diversity substantially increases the probability of phase transition for social systems. Coordinated behavior is at the core of many asymmetric outcomes, including favorable (best-selling books, venture capital) and unfavorable (national security, lending) outcomes.

Be mindful of the level of diversity and recognize that state changes often come suddenly.

3)Don't believe to forecasters. Accuracy of forecasts in systems with phase transitions is dismal even by so-called experts.

4)Mitigate the downside , capture the upside.(Easily said than done)

Use Kelly formula to explicitly state the range of possible outcomes and estimated probabilities of different outcomes. Allocate any financial resources only after conservative calculation of percentage of portfolio that should be wagered on the bet using Kelly's formula.

Betting too much in a system with extreme outcomes leads to ruin . Therefore avoid betting on fragile systems and assets.

In dealing with systems of collectives, the ideal is to get cost-effective exposure to positive events and to insure against negative events.(Long beta long Vol strategies [Artemis Capital])

How to apply to yourself:

The best course is to recognize the nature of the distribution and to prepare for all contingencies.

Recognize the nature of phenomena, things and people on the scale of fragile - robust -antifragile. Estimate the nature of impact caused by changes in some critical parameter. If the magnitude of the negative impact accelerates with changes in parameter than the system is fragile.

Avoid betting on fragile systems and assets.[Too much debt, possibility of business to be disrupted]

Be mindful of the level of diversity and recognize that state changes often come suddenly.

Don't believe to forecasters.

Use Kelly's formula to explicitly state the range of possible outcomes and estimated probabilities of different outcomes. Allocate any financial resources only with the use of the Kelly's formula.(?The problem with KF us that we tend to overestimate probabilities and magnitude of positive outcomes)

In dealing with systems of collectives, find ways how to get cost-effective exposure to positive events and to insure against negative events.

How to apply to others:

Bet against fragile systems and assets.

Mistakes #8 Mistakes of failure to distinguish skill from luck / failure in understanding reversion to the mean.

In many human endeavors, the outcomes are a combination of skill and luck. Any system that combines skill and luck will revert to the mean over time.

Example:

Hiring (after period of outperformance) and firing (after a period of underperformance) investment managers at wrong times.

Pouring money into hot markets and yanking it out after drop (Buy high sell low).

Analysts regularly neglect the evidence for reversion to the mean in considering essential drivers like company sales growth rates and levels of economic profitability.

[Mistake of misinterpretation of data]

Reversion to the mean does not imply the triumph of mediocrity. A more accurate view of the data is that over time, luck reshuffles the same companies and places them in different spots on the distribution. Naturally, companies that had enjoyed extreme good or bad luck will likely revert to the mean, but the overall system looks very similar through time. *Always check out the distribution before making any conclusions!*

Mean reversion works in both directions.

Here is how to think about it. Say results are part persistent skill and part transitory luck. Extreme results in any given period, reflecting really good or bad luck, will tend to be less extreme either before or after that period as the contribution of luck is less significant.

[Mistake of providing feedback based on outcomes(instead based on process) for a system with high degree of luck involved]

Feedback based only on outcomes is nearly useless if it fails to distinguish between skill and luck.

[Halo effect(liking - loving tendency) / Reverse Halo effect (disliking -hating tendency)]

Tendency to make a specific inferences based on general impressions.

Example: Viewing all features, qualities of someone or something higher if you like/love it.

People tend to observe financially successful companies, attach attributes (e.g., great leadership, visionary strategy, tight financial controls) to that success, and recommend that others embrace the attributes to achieve their own success. Don't paying proper attention to the role that luck played in performance of the businesses.

The press will praise a company that is doing well for having “a sound strategy, a visionary leader, motivated employees, an excellent customer orientation, a vibrant culture, and so on.” But if the company’s performance subsequently reverts to the mean, onlookers will conclude all of those features went wrong, when in reality nothing of the sort happened. In many cases, the same people are running the same business with the same strategy. **Mean reversion shapes company performance, which in turn manipulates perception.**

The press’s tendency to focus on extreme performance is so predictable that it has become a reliable counter-indicator. For the two years following the articles, the stocks of the companies that the magazines criticized outperformed the companies they praised by a margin of nearly three to one.

[Tom Arnold, John Earl, and David North]

How to deal with mean reversion and Halo effect:

1) Evaluate the mix of skill and luck in the system that you are analyzing.

(Test for whether an activity involves a skill: Can you lose on purpose?)

Be careful when you draw conclusions about outcomes in activities that involve luck— especially conclusions about short-term results. We’re not very good at deciding how much weight to give to skill and to luck in any given situation. When something good happens, we tend to think it’s because of skill. When something bad happens, we write it off to chance. So *forget about the outcome and concentrate instead on process.*

2) Carefully consider the sample size.

People extrapolate unfounded conclusions from small sample sizes. The more that luck contributes to the outcomes you observe, the larger the sample you will need to distinguish between skill and luck.

Streaks, continuous success in a particular activity, require large doses of skill and luck. In fact, a streak is one of the best indicators of skill in a field. Luck alone can’t carry a streak. Streak holders are among the most skilled in their fields. The key is to know how large should be the sample size to recognize series of successes as a good indicator of skill level.

3) The first impression you have of a person or organization can determine your future degree of interaction. So if you run a business that deals with customers, ***it is especially important to make sure that you make a favorable first impression.[Halo effect]***

Any time you see an approach offering secrets, formulas, rules, or attributes to achieve success, you can be sure that someone is selling you a nostrum. Still, spotting the halo effect requires discipline, because the purveyors are selling alluring stories and suggest substantial, albeit phony, rigor.

4) Watch for change within the system or of the system.

5) When outcomes are really good because of a dose of good luck, prepare for the times when they will be closer to the average. When outcomes are disappointing as the result of bad luck, recognize things will get better.

General recommendations:

1) Become well versed in recognizing poor thinking and second-rate decision making in others, you will be in a better position to flag a potential mistake when it faces you. **[Train skill of bias recognition]**

Book: A Mathematician Reads the Newspaper

2) **Put yourself in the Shoes of Others**. It helps to embrace outside view and find relevant reference class to estimate situation more objectively. [Know Base rate]

It also helps to understand the power of situation.[avoid Fundamental attribution mistake]

It also helps to understand what incentivizes people, it is especially helpful when their decisions can affect you.[The Power of Incentives]

Take a negotiation course, because skilled negotiators are masters at figuring out what is important to the other party and arriving at mutually beneficial solutions.

Develop empathy which is a key for understanding and positively affecting decisions of others.

3)Recognize the Role of Skill and Luck.

When luck is prominent in shaping outcomes, you should anticipate that reversion to the mean will make it likely that extreme outcomes are followed by more average outcomes. The bigger the part that luck plays, the more data I'll need to properly disentangle the components of skill and luck.

*4) Get **Feedback**.*

One of the best ways to improve decision making is through timely, accurate, and clear feedback. This type of feedback is central to deliberate practice, the essential ingredient in developing expertise.

The lesson is that even good feedback is not useful if you do not use it.

A well-kept journal offers a pair of benefits.

1)The journal allows you to audit your decisions.

2)Another benefit is the potential to find patterns. When you review your journal, you may start to see relationships between how you felt and how the decision worked out.

5)**Create Checklists**

People underutilize checklists. But a checklist's applicability is largely a function of a domain's stability. In stable environments, where cause and effect is pretty clear and things don't change much, checklists are

great. But in rapidly changing environments that are heavily circumstantial, creating a checklist is a lot more difficult. In those environments, checklists can help with certain aspects of the decision. For instance, an investor evaluating a stock may use a checklist to make sure that she builds his financial model properly.

A good checklist balances two opposing objectives. It should be general enough to allow for varying conditions, yet specific enough to guide action. Finding this balance means a checklist should not be too long; ideally, you should be able to fit it on one or two pages. If you have yet to create a checklist, try it and see which issues surface. Concentrate on steps or procedures, and ask where decisions have gone off track before. And recognize that errors are often the result of neglecting a step, not from executing the other steps poorly.

6)Create **Premortems**

Process that occurs before a decision is made. You assume you are in the future and the decision you had made has failed. You then need to provide plausible reasons for that failure. In effect, you try to identify why your decision might lead to a poor outcome before you make the decision.

("A failure is the result of failure to think about a failure.")

Premortems help people identify a greater number of potential problems than other techniques and encourage more open exchange, because no one individual or group has invested in a decision yet. You can track your individual or group premortems in decision journal. Watching for the possible sources of failure may also reveal early signs of trouble.

7)Know what you know (circle of competence).

Know what you don't know.

Know what you don't need to know / can't know.

Be aware of possibility that you really don't know something you think you know.

In decisions that involve systems with many interacting parts, causal links are frequently unclear. Considering the worst-case scenarios is vital and generally overlooked in prosperous times.

Resist the temptation to treat a complex system as if it’s simpler than it is. One of the greatest challenges in finance is to create models that are useful to practitioners but also capture the market’s large moves. We can trace most of the large financial disasters to a model that failed to capture the richness of outcomes inherent in a complex system like the stock market.

8)Don't make important decisions when you are tired, under slept, emotionally aroused, in poor health.