Concepts...

DAEDALUS OVERSIGHT

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Recognizing & Managing Uncertainty

"Success is a lousy teacher. It seduces smart people into thinking they can't lose." - Bill Gates

In today's challenging and uncertain economy, business leaders are looking for tools to ensure success but will they heed Bill Gates warning if they attain it?. Managers learn and apply many techniques to manage their responsibilities, but then are tempted to keep repeating the successful methods. How could this be wrong? In my article "Lies, Damn Lies and Statistics", I discussed the potential, limitations and the inherent flaws of statistical risk models. Even with a command of the risks, managers need a sound understanding of control and process dynamics to consistently perform well. The understanding is counter-intuitive to many engrained practices of managing and controlling business environments.

I propose that: *rather than being able to control any situation, resources, process or organization, you only have a strong influence over a limited, finite environment.* I will outline some fundamentals from science and current business literature that back this proposal and then demonstrate it through real examples in the business and natural world. The detailed understanding of these scientific concepts is not needed, but a realization of their conclusions and applicability to management challenges is essential.

Managers have to cope with issues of control in dynamic, complex and interdependent environments. Dynamic situations can be described as Linear or Non-Linear. Linear relationships mathematically can be described as factors of the first power of a variable e.g. production output's relationship to productivity and time. However, most dynamic systems have non-linear, higher power or function relationships (e.g. x^2, x^3, sin x). It may be surprising to hear that although there are equations to describe a single planet's movement around the sun, as soon as you introduce a second planet, the equations for three bodies become unsolvable. Yet somehow scientists send space probes successfully to the outer solar system predicting where all the planets and moons will be on the way.

Science historically placed a great deal of credence in reducing problems to their fundamental roots and then building a deterministic model of any situation by assembling the analyzed building blocks. This lead Marquis Pierre Simon de Laplace in the 18th century to postulate that the "*present state of the universe as the effect of its past and the cause of its future*"

After 'Risk Appreciation' training, we move on to 'Unintended Consequences'!

- he was technically wrong. There was even a period when scientists were predicting the end of science as they thought they were running out issues to determine. (Sounds like the flawed predictions of the end of history, the end of the boom and bust cycle, the death of inflation or even climatic Armageddon - but more of that later).

However, uncertainty in quantum dynamics, non-linear equations and chaos theory shows that it is impossible to predict with absolute certainty any future event. Yet we seem to place a great deal of effort in trying to and believing people can predict the future. People, for example, use economic models, business models, weather forecasts, trading algorithms and global climate models. Are all these models inaccurate? Approximately, no. Are they flawed? Fundamentally, yes. All of the above models are encapsulated in computer programs. Computer programs are linear processes. There are starting conditions, inputs, logical calculations and outputs. How can a non-linear system or process be recreated from a linear program? It can't, but it can be modeled.

Non-Linear equations, like the three-body, planet problem

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can't be solved specifically, but through numerical analysis an answer can be generated. Numerical analysis runs an approximation to the problem as a *linear*, iterative calculation that tends (i.e. gets closer) to but never quite equals the non-linear answer. The smaller the increments that are considered and the greater the number of iterations, the more accurate the answer is and the bigger the computer you need. So we can send spacecraft to the outer solar system over a few years with confidence as the inaccuracies in that time period are inconsequential.

Separately, although systems are naturally chaotic and non-deterministic, the studies of complexity have shown there is a tendency for systems (natural or artificial) to self organize. Even chaotic systems can be shown to operate within finite limits described as "strange attractors" - there is a consistency to the inconsistency. Just as special cases of the equations of chaos generate the beautiful fractal images, many dynamic systems exist in stable and seemingly predictable phases. They are also influenced by transient dominant hubs. The science of complexity is eloquently described in the books Sync by Steven Strogatz and Linked by Albert-Laszlo Barabasi. The paradox of the science of complexity is that it will, over time, better describe *why and how* things are the way they are but will never be able to say with absolute certainty what they will do next.

So, through numerical analysis, approximations to reality and the fact that the crazy business world we try to manage will self organize and create periods of stability, it is possible to create models which reasonably replicate current environments. The problem occurs when we believe the model's predictions without considering that the model maybe flawed or that the environment being modeled won't change. An economic model of 10 years ago could not imagine the dot-com boom and bust or the impact of the rise in securitization through cheap money and quasi-government guarantees. A business model of a few years ago could not predict the rise of networking sites and new media outlets such as YouTube, Facebook and Twitter. Weather forecasts are only good for about 5 days into the future as the unaccounted variables become too influential and uncertain at greater periods. Trading algorithms work until there is a "tectonic" event or a "fundamental change" in the market. The method's own terminology points to their Achilles' heel. Climate models (remembering weather forecasts can't get past 5 days) show rising carbon dioxide emissions creating global climate chaos throughout the coming century! This prediction is based on the model's assumption that increased carbon dioxide emissions causes the Earth's temperature to rise. Lord Christopher Monckton has shown that the causation is reversed and it is global warming that causes carbon dioxide levels to rise and that the Earth's temperature is driven predominantly by solar activity. One of these positions is wrong and is going to lead to some very bad decisions.

Reconsider the original premise: *rather than being able to control any situation, resources, process or organization, you only have a strong influence over a limited, finite environment.* This proposal gives you humility to understand that, whatever success you have, it is based on you operating in your limited, finite environment. Continuity of performance cannot be maintained if anything else outside invades or impacts that environment. Your models are useful tools to outline probable eventualities, but you resist augmenting, questioning and adapting your models at your peril. With this mindset, you will now:

- question and monitor your results and the consistency of your environment
- proactively envisage the impact of changes to your environment
- consider other environments to work within and develop contingency plans for those eventualities

The world and the business environment can be described as exhibiting periods of stability which experience occasional volatility and infrequent dramatic changes, of which *none* can be predicted with certainty. A manager needs to understand that in order to *recognize and manage the uncertainty*. From Bill Gates' perspective, you will not take success to mean that you are infallible, smart enough to deal with anything or that you will continue to succeed based on past performance.

The counter intuitive position is that despite any success, you should always continue to question the premise of all your decisions and actions. So what do we measure? How can we better question, monitor and adapt? Haven't these issues already been addressed in the many management books written over the years? Those are the topics for the next newsletter.

Paul F. Dowding

Daedalus Oversight would be pleased to discuss the realization of these concepts with you further. We thank you for your consideration.

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