

# Value Management Insights

A series of articles about VM and its applications



## COGNITIVE TRAPS, GAPS & BIASES – WHY VALUE MANAGEMENT WORKS

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### Abstract:

Value Management (VM)<sup>(1)</sup> is a powerful problem solving framework that has been proven to deliver a high return on investment<sup>(2)</sup>. There is an extensive literature describing the development and practice of VM yet very little on why it works<sup>(3)</sup>. How can we expect to persuade senior executives to deploy VM when they are unclear about the reasons for its effectiveness? This article explores the hypothesis that VM works by overcoming the many cognitive traps, gaps and biases inherent in the way human beings process their environment and develop solutions to perceived problems and opportunities. It then explores some well-known examples of cognitive failure in management decision making and the idea that VM can be used to mitigate these risks, help future proof organizations from industry disruption and maximise long term value for their key stakeholders.

### Why does VM work?

VM delivers remarkable solutions to difficult problems yet the literature is not at all clear about why it works. Although rarely articulated, conventional wisdom is that VM works via:

- Multidisciplinary teamworking is much more effective than single person problem solving as it:
  - Ensures a holistic understanding of a problem from multiple stakeholder perspectives
  - Provides access to knowledge and expertise to solve the problem
  - Enhances creativity via skilfully facilitated team dynamics
- The VM Study Plan separates creativity (a 'Right Brain' activity) from information, analysis and evaluation ('Left Brain' activities)<sup>(4)</sup>. This allows VM teams to use their 'analytical' and 'creative' brains to best effect.
- Function Analysis (especially FAST Diagramming) enables VM teams to focus on areas of high opportunity. A good way to think about this is via the old proverb 'Necessity is the mother of invention.' Function Analysis focuses human creativity on where it is most needed.

These are all good reasons for the effectiveness of VM. Yet they don't fully explain the failures in human cognition that lead to VM's team based effectiveness. The reason why VM is so effective is that it overcomes the many cognitive failings each of us as individuals have in our perception of the world.

Before we can understand why VM works it is helpful to categorise human cognitive failure into three groups: cognitive traps, gaps and biases. Let's discuss the characteristics of each of these and then demonstrate how VM mitigates their impact.

## Cognitive traps

We define any error due a failure in memory or logic as a cognitive trap. If you've ever closed the front door behind you without your keys you've fallen into a cognitive trap. If you've ever made a mathematical error that's also a cognitive trap.

Individuals are much more prone to cognitive traps than teams. It is unusual for a family to exit their home without someone remembering the front door key. It is also rare for someone in an entire class of students to not be able to solve a regular mathematics problem set by their instructor.

Teamworking within the VM process allows the best and brightest to shine through. Poor solutions are considered and discarded. Cognitive traps are avoided.

## Cognitive gaps

We define a cognitive gap as a lack of knowledge about key elements of a specific problem or decision. They cover the simple fact that 'we don't know what we don't know'. So when we attempt to solve a novel problem we usually don't:

- Have access to all the information we need to tackle it
- Have the necessary skills or expertise to solve it
- Know how other people have tackled it before
- Have the creativity to develop the best new solutions to it

In the real world cognitive gaps have a massive impact on the performance of human problem solving and decision making. How can you make an optimal decision if you are totally ignorant of global best practice, a key technology, an important piece of missing information or a useful analytical technique?

Multidisciplinary teamworking within the VM process ensures that the expertise required is available to solve the problem. Missing information is gathered by the team as a core part of the VM Study Plan. Analysis leads to fresh insights and creativity to new solutions. Cognitive gaps are avoided.

## Cognitive biases

### Evolution has given us a wonderful but flawed brain

The human brain is a remarkably effective computing device that evolution has optimised for its environment through the brutal process of natural selection. Those not smart enough to survive didn't get to reproduce and were outbred by those who were. Look at what happened to the Neanderthals.

Although our brain is structured for an ancient environment (survival has largely ceased as an evolutionary force with the rise of organised agriculture ~10,000BC) it still works pretty well in the modern world. Yet the forces of evolution have wired it to take short cuts via two critical processes:

- Data collection, compression and storage
- Data recovery and decision making

We'll now explore each of these processes and demonstrate how they lead to cognitive biases.

### Data capture, compression and storage

Our senses are exposed to a colossal amount of inbound data. See Table 1 below.

<b>Sensory System:</b>	<b>Total Bandwidth: (Bits/S)</b>	<b>Conscious Bandwidth: (Bits/S)</b>
Eyes	10,000,000	40
Ears	100.000	30
Skin	1,000,000	5
Smell	100,000	1
Taste	1,000	1

**Table 1. Human Brain Bandwidth Model<sup>(5)</sup>**

To get a sense of how our brain compresses visual information, try the following experiment in a public space. Extend an arm so that you can see your thumbnail at arm's length. Then take someone's head around 5 metres away and use your thumbnail to cover it. Focus first on your thumbnail and then focus your eyes on the human head as you drop your arm. As you keep your eyes firmly locked on the head notice how everything apart from the head in your field of view is fuzzy and indistinct.

We imagine that our eyes give us a detailed picture of the world. What we in fact see clearly is a small area roughly the size of our thumbnail at arm's length and the rest of the image at extremely low resolution. Our impression of visual clarity is an illusion created by the way our brain stitches together the low resolution image with detail provided by our flickering thumbnail sized 'attention spot'.

What I've described here is just the start of the data compression and storage journey. Our brain selectively stores a fraction of each image in short term memory during the day. While we are asleep these images are sorted and stored in long term memory. Over time memories of some of these images are retained while others evaporate. A similar process happens with each of our other senses.

Of course the human brain is a massively complex system that is still poorly understood. Yet the above model isn't a bad overview of how it functions from a systems perspective.

## **Data recovery and decision making**

So here we are, alive in a world where we need to retrieve highly compressed information to survive and solve problems. How do we do it?

In his bestselling book 'Thinking Fast and Slow', Nobel laureate Daniel Kahneman explains that our brain has two types of system dedicated to this task<sup>(6)</sup>.

System 1 is a set of fast systems optimised for rapid recall and processing. These are the systems that kick in each time we catch a ball, recognise a friend or tie our shoe laces. They evolved to help us swiftly exploit opportunities and avoid threats in our environment.

System 2 are the slow systems we use to tackle novel and difficult problems. System 2 can access a lot more stored data than System 1 but retrieval can be extremely slow. We chew problems over, scratch our heads and after much thought come up with a solution. Quite often the solution jumps into our mind days, weeks, months or even years after we start working on the problem.

The nub of the problem is that our brains are lazy and therefore naturally inclined to use our fast System 1 to tackle problems which are much better solved by our slow System 2. This often leads to poor decisions as a result of what are known as cognitive biases.

## **There are many cognitive biases**

Kahneman and many other psychology researchers have identified and researched dozens of cognitive biases which affect our ability to make sensible decisions. Here are just three examples:

### **Confirmation Bias:**

We tend to look for evidence that confirms our initial view of the world and wilfully ignore evidence to the contrary. A good example of this is that executives often blindly bid up the price of an acquisition well beyond the point it makes financial sense. On the stock market the share price of target companies often rise whilst that of the acquirer goes down after a bid is announced<sup>(7)</sup>.

### **The Lottery Bias:**

Many people play the lottery in the vain hope of a big win when simple mathematics shows this is highly improbable and that they are wasting their time and money. In the business world many firms lose focus on their core business by over investing in non-related start-ups. It will be interesting to see if Google's shareholders ever see a reasonable return on the fortune its executives are gambling on non-core ventures<sup>(8)</sup>.

### **Not Invented Here Syndrome (also known as the ‘IKEA Effect’):**

People place a disproportionately high value on objects that they assemble themselves regardless of the quality of the end result. Many firms and government organizations cling to inefficient shared services which they could much more efficiently outsource<sup>(9)</sup>.

There are dozens more cognitive biases which have a major impact on problem solving and decision making in the real world. The net result is that a massive amount of value is destroyed daily in the private, public and not-for-profit sectors.

### **So how does VM overcome cognitive traps, gaps and biases?**

Cognitive traps, gaps and biases are a massive challenge in problem solving and decision making. VM provides a powerful framework to overcome them and identify many more options and opportunities than most people can imagine.

Let us now explore how each of the core elements of VM overcome cognitive traps, gaps and biases.

#### **1. Choosing the Right Client Problem to Study**

All problems have a client, i.e. someone who wants to solve them. The client is normally an executive tasked with investigating ways to maximise value in areas under their professional control.

In the world of retail there’s an old proverb: “the customer is always right”. This makes sense because the impact on a firm’s reputation of an unsatisfied customer is much higher than the relatively small cost of sorting out their problem.

However, in the world of business problems the opposite is often true. Cognitive traps, gaps and biases are quite likely to lead the client to be misguided or even completely wrong in their initial assessment of an issue.

The Planning Phase of the VM Study Plan ensures that the facilitator and study team properly investigate the client’s problem. Where necessary this is challenged and a better problem is formulated.

#### **2. Selecting the Team with Relevant Knowledge and Expertise**

VM features multidisciplinary teamworking. Why is this an integral part of the VM process and how is it so effective at combating cognitive traps, gaps and biases?

The answer is straightforward. As we have seen, individuals suffer from cognitive traps, gaps and biases which limit their insights and hamper the quality of their problem solving and decision making.

Although each of the members of a diverse multidisciplinary team will have their own cognitive shortcomings these normally differ significantly from those of other team members. Thus much more of the knowledge and expertise required to tackle the problem will be available to the team than any individual. This helps tackle potential cognitive failure.

#### **3. Structured Team Working Via the VM Study Plan (aka VM Work Plan or VE Job Plan)**

Without a structured framework teams tend to be led by the most assertive individual. This person may or may not be right in their assessment of the problem and the actions needed to solve it. This leader exposes the team to their personal cognitive traps, gaps and biases about the problem and often use their considerable powers of influence<sup>(10)</sup> to take the team in the wrong direction.

The VM Study Plan provides a simple and elegant structure which removes personality from the process. It does this by providing a framework that allows everyone to contribute based on their expertise and creativity. It creates a democratic environment where everyone’s contributions are valued.

#### **4. Building a Suitable Data Platform to Fully Understand the Problem**

Management practices have evolved considerably over the past few decades. A key feature has been the emergence of Evidence Based Management<sup>(11)</sup> over the 'gut feel' mentality that often drove decision making in the past.

Doctors operate within a framework of Evidence Based Medicine. As far as possible the way they cure patients is guided by best practice discovered through a process of scientific research. Clinical trials ensure new medications work and don't harm patients. With specific patients different treatments are often tried and the results are carefully assessed to determine which is most effective.

Evidence Based Management is simply the principle that as far as possible executive decisions should be supported by facts, data and analysis. The VM Study Plan is designed to support this approach.

Evidence is gathered by the team during the Information and Analysis Phases of the VM study. This provides a sound platform to support and drive creativity.

Evidence is also used during the Development Phase to support the team's recommendations. Without a suitable data platform management is simply not in a position to fully understand a problem and make wise decisions. It suffers from cognitive gaps.

#### **5. The Use of Function Analysis and Other Relevant Analytical Techniques**

Tens of thousands of management books and articles are written each year. Many of them feature useful analytical techniques. The VM Study Plan provides a framework that enables the team to systematically select and deploy any suitable analytical techniques during the course of a VM study.

Although any analytical technique can be used during a value study, it is not VM unless some form of function analysis is used. The most common technique is Function Analysis Systems Technique (FAST) developed in the 1960s by Charles Bytheway<sup>(12)</sup>.

FAST diagramming is a powerful tool for mitigating the impact of cognitive traps, gaps and biases. This is because FAST diagrams can be constructed from the perspective of each stakeholder and thus can be used to provide a '360 degree view' of a problem. This much reduces the risk of the team falling into the cognitive trap of missing a key stakeholder requirement.

FAST diagrams can be constructed to any level of detail allowing a team to build a comprehensive understanding of a situation. They ruthlessly expose cognitive gaps in the team's understanding of a problem which helps eliminate them from creative problem solving and decision making.

FAST diagrams also mitigate the impact of cognitive biases by getting the team to understand the underlying reasons for a specific function. This allows the team to explore innovative solutions rather than return to the same old ways of doing things.

#### **6. Creativity Driven by the Function Analysis to Identify Possible Solutions**

The course handbook for the Creativity, Innovation and Change Module for The Open University's MBA programme lists 154 techniques which can be used to drive creativity in a management context. Any of these techniques can be used within the VM Study Plan. However a key feature of VM is the use of various forms of function analysis to identify possible solutions and mitigate human cognitive failure.

#### **7. Structured Development of Options to Identify the Optimum Solution(s)**

We saw earlier that Evidence Based Management is a core VM principle. We also saw how the Information and Analysis Phases of the VM Study Plan are used to identify and minimise the impact of cognitive gaps and biases and drive creativity.

Structured techniques are used after the Creative Workshop to evaluate and develop opportunities. This provides the evidence needed to support management recommendations. Just because a creative idea initially sounds great to the team doesn't mean that it should be implemented. Many initially good ideas turn out to be flawed when systematically evaluated and developed.

The VM process provides the evidence that management is making the correct decisions.

### **8. A Report With Clear Recommendations and an Action Plan**

Traditionally the findings of a VM team are presented to senior management in the form of a report. This report identifies actions that need to be taken and seeks approval for implementation.

Although this traditional model is still alive and well, albeit with the report often in the form of a PowerPoint presentation, it has been enhanced to recognise that these days most organizations are very complex. There are multiple stakeholders and lines of communication. Any initiative needs to be supported by all stakeholders affected by it otherwise it will probably fail.

The main cognitive traps, gaps and biases associated with reporting are a failure to recognise the importance of key stakeholders and a failure to consult them during the course of a VM study. How can you expect a senior executive in another division to support your initiative if they have not been involved in developing it or been consulted?

A well planned VM study features a communications plan in which key stakeholders are identified and consulted at key points throughout the process. This mitigates the risk of them not supporting the team's recommendations and fosters a bias for implementation under a suitable project management framework.

VM applied at an organizational level can achieve what is described as a value culture<sup>(14)</sup>.

### **9. A Suitably Qualified VM Facilitator**

Your child has toothache. Would you consult an unqualified dentist? Didn't think so. The same is true when you choose a doctor, lawyer, structural engineer, chartered accountant and most other professions. Whenever a profession or trade has the potential to harm the public it is regulated with strict professional standards for performance and conduct.

Poor VM practice certainly has the potential to harm the public. Overzealous cost cutting in the quest for cost savings can undermine the safety of structures such as buildings and products such as motor vehicles. It can also impact the safety of critical infrastructure such as bridges, nuclear power stations, railways and utilities as well as the quality of services.

For these reasons there are two main systems globally for the certification of VM Facilitators. In the US there's the Society of American Value Engineering's professional certification scheme. In Europe there's 'Value for Europe' which sets the standards for VM practice and certification throughout Europe. Under this European countries have professional VM associations which deploy suitable professional certification systems. In the UK, for example, there's the Institute of Value Management.

### **10. An Effective VM Governance Framework**

It should now be clear that VM is a powerful way to maximise value by mitigating the impact of cognitive traps, gaps and biases. The challenge now becomes how to ensure an organization properly establishes best VM practice.

All professional practices require a suitable governance framework to ensure they are being deployed correctly. In the case of a single VM study this can be as simple as having an experienced client capable of identifying whether the study has been conducted properly. Where VM is widely deployed throughout an organization it is normal to have a VM governance framework in place.

The European Standard BS EN 12973:2000<sup>(12)</sup> describes the main elements of effective VM framework and how they can be used to develop an organization's value culture.

## **VM Can Be Used to Mitigate Cognitive Failure in General Management**

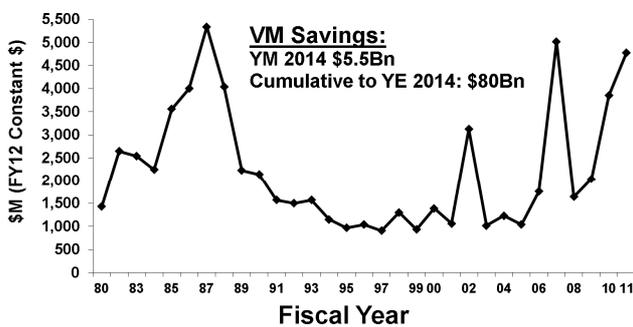
VM can be used to enhance value and mitigate the risk of cognitive failure in general management practices just as effectively as it does in the design, development and improvement of products, services, projects and business processes.

Take a minute to consider the well-publicised cognitive failures of senior executives at major firms such as BP, Volkswagen, HSBC and Tesco. These resulted in large government fines, scandal and litigation by affected parties. Surely the systematic use of VM at a senior level would have helped these executives to identify the cognitive traps, gaps and biases that ended up costing them their careers?

Far sighted organizations are using VM to optimise all dimensions of organizational performance. Skillfully used VM can future proof an organization against the many disruptive forces affecting its industry. It can also be used to mitigate the risk of poor senior executive decision making in the business, public and not-for-profit sectors.

## References:

- (1) Value Management covers the closely related practices: Value Engineering, Value Analysis, Value Planning, Value Control and Value Methodology. See: <http://www.value-eng.org/> & <http://ivm.org.uk/>
- (2) US Department of Defense & US Highways Agency use VM extensively. During the year ending 2014 the US Department of Defense reported VM savings and benefits of \$5.5Bn. The US Highways Agency secured savings of \$1.73Bn and reported a Return on Investment of 200:1. See charts below.



Source: US Department of Defense

	FY 2014
Number of VE Studies	215
Cost to Conduct VE Studies and Program Admin	\$8.7 M
Estimated Construction Cost of Projects Studied	\$20.9 B
Total Number of Proposed Recommendations	1,664
Total Value of Proposed Recommendations	\$3.0 B
Number of Approved Recommendations	697
Value of Approved Recommendations	\$1.73 B
Percent of Project Cost Saved	8.32%
<b>Return on Investment</b>	<b>200:1</b>

Source: US Highways Agency

- (3) There is very little published on the human psychology of VM. This paper was written to start a discussion to rectify this gap.
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- (10) Robert Cialdini, 1984, *Influence - The Psychology of Persuasion*, Harper Collins, USA
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- (13) BS EN 12973:2000 Value Management
- (14) US Office of Management and Budget (OMB) Circular A-131

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