

# Decisions, Decisions

How cognitive bias affects decision  
outcomes

Palisade Risk Conference  
2010

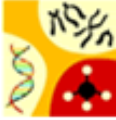
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Chris Brand

Michael Brand

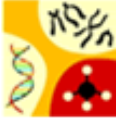


# About Captum...



- Formed in 2004
- Transatlantic presence
- Specialised consulting to:
  - Private companies (pre-IPO)
  - Life science sector (Biotech, Med Dev, Pharma)
  - Business development, valuation, partnering
- **MasterClasses in Business Development**
  - Valuation Masterclass attended by over 500 executives in UK and Europe

# About us...



**Chris Brand**

- Associate, Captum
- BSc Philosophy & Psychology, Keele
- MA Philosophy, York
- MSc Cognitive and Decision Science, UCL

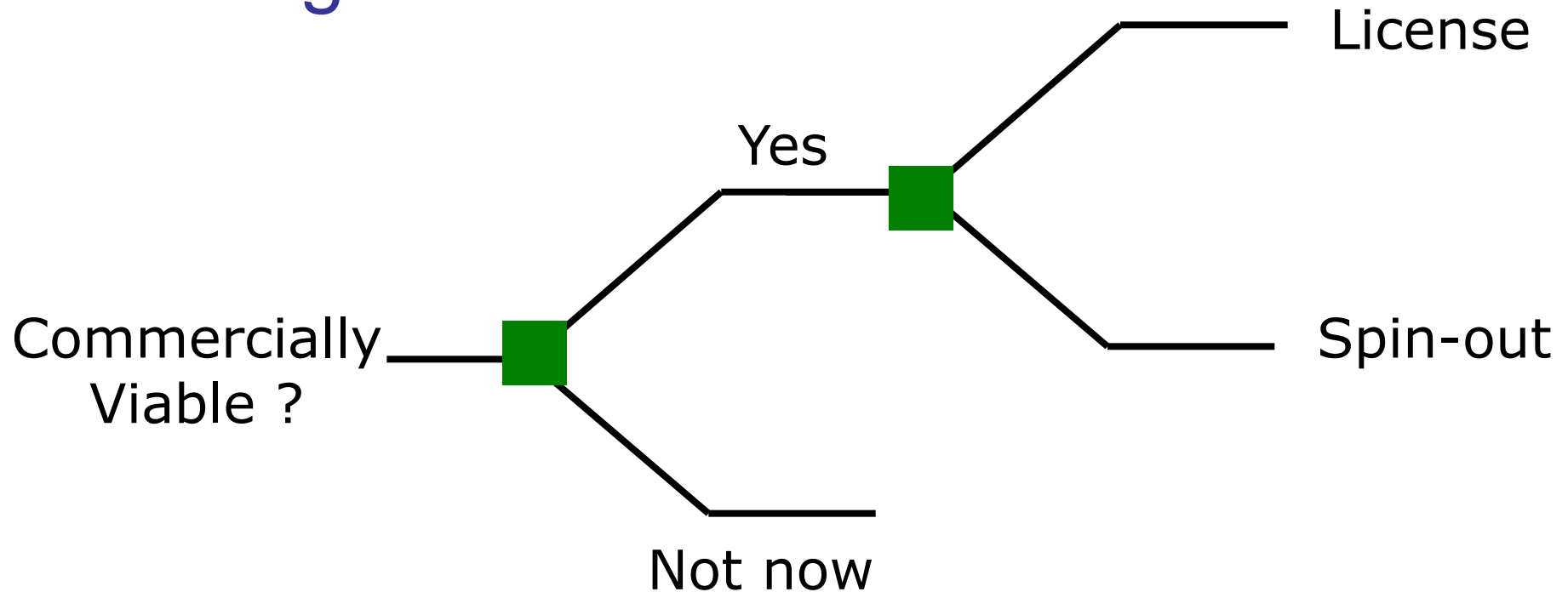


**Michael Brand**

- Director, Captum
- NX Director, RDH NHS FT
- PhD, Imperial College
- MBA, MIT Sloan School

# New Technology:

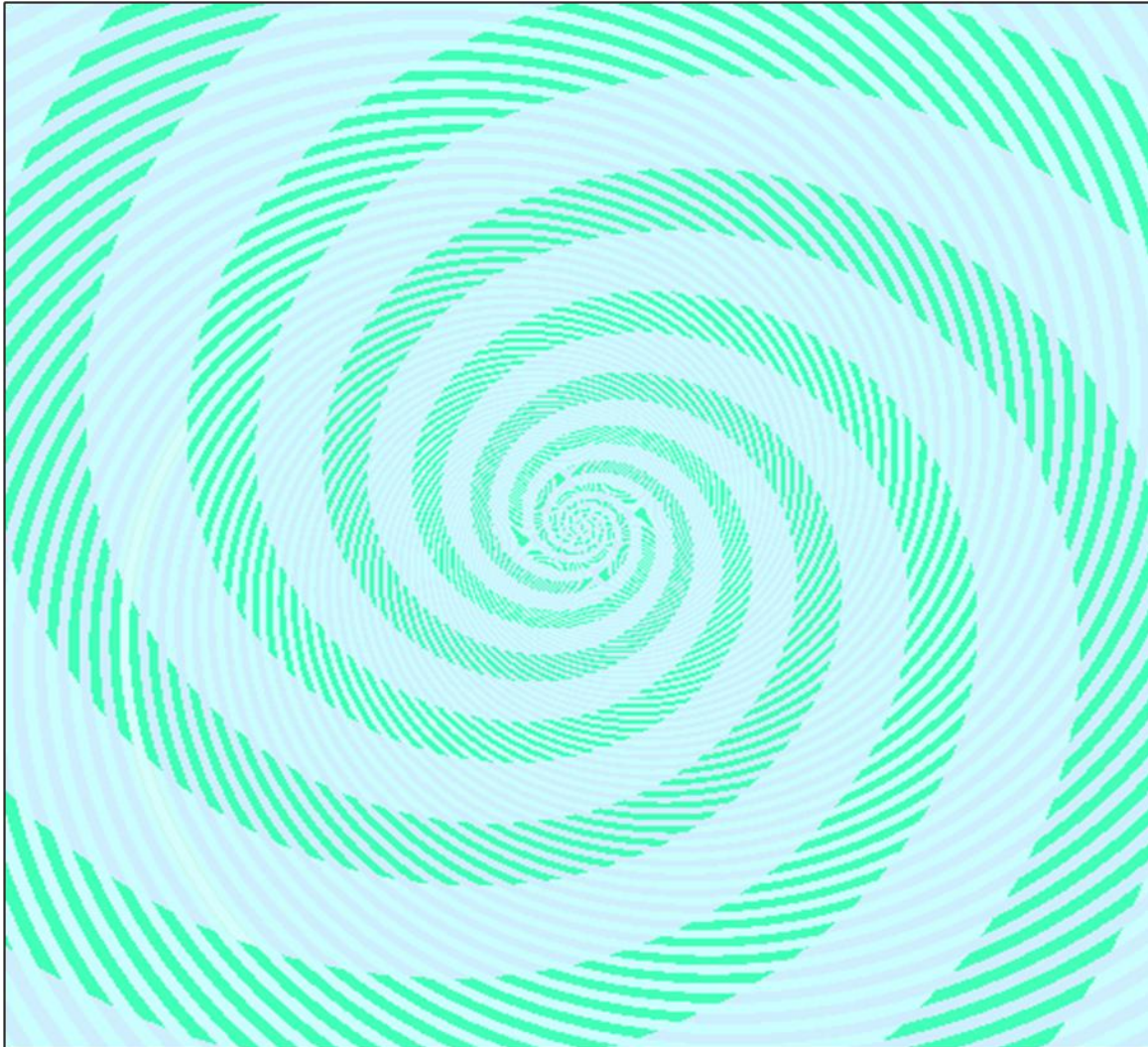
## Strategic decisions



# How many colours can you see?



# Remove pink & orange...



# Decision Bias



## 1. Perception error

# What is his occupation?



- He lives in the UK
- He enjoys classical music
- He supports Norwich City Football Club
- He lives with a partner and a dog
- He is either:
  - A musician, or
  - A construction worker

# Occupation probabilities



- Professional musicians
  - >30,000
  - Source: [www.musiciansunion.org.uk](http://www.musiciansunion.org.uk)
- Construction workers
  - >1,900,000
  - Source: Office for National Statistics

# Decision Bias



1. Perception error
2. Stereotype bias

# Consumer decisions



- You are in a shop, about to make a purchase
- Another customer whispers to you that the identical item is on sale at another shop, 10 minutes away, for £10 less.
- Do you go to the other shop to buy the item?

# It's all relative



## Left hand side:

- You are buying a suit for £500

## Right hand side:

- You are buying a pen for £25

In both cases, you could save £10

It is irrational not to do so in both cases

Dan Ariely (2009), *Predictably Irrational*

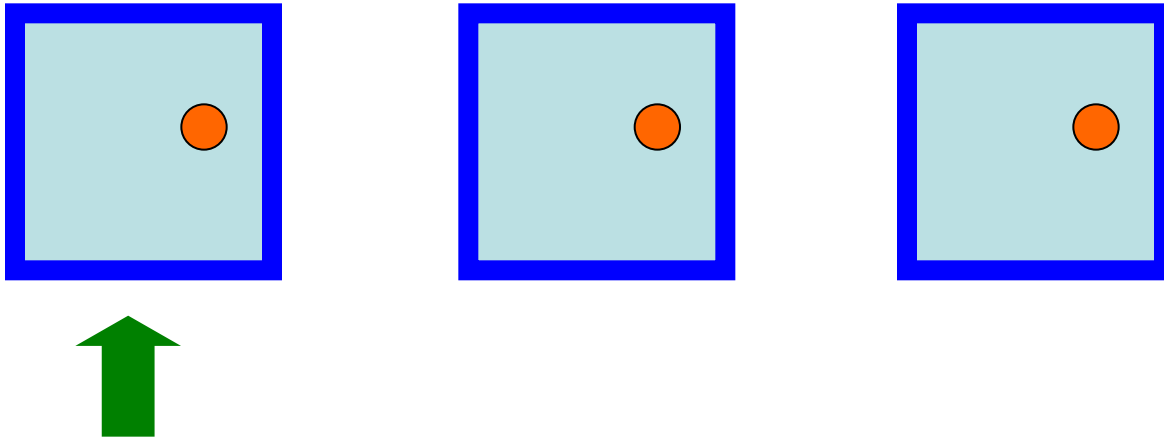
# Decision Bias



1. Perception error
2. Stereotype bias
3. Relativity bias

# The empty box problem

Your have three boxes:



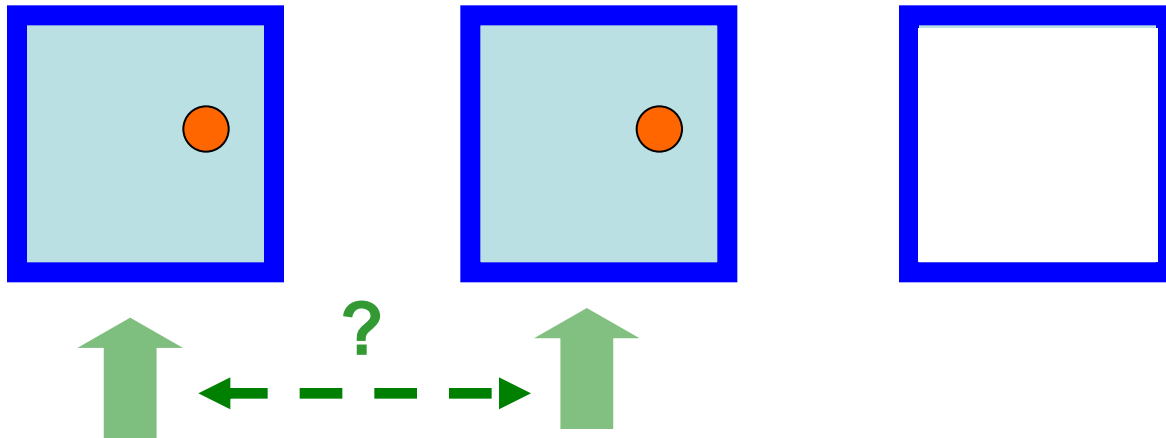
One contains £1million,

Two are empty

Choose the box which you think contains £1 m

# The empty box problem

One of the other boxes which does NOT contain £1 m is now opened



You have the option of changing your selected box.

Should you change your selection?

# Simulation model

- It is difficult to test this experimentally, but Decision Tools provides a good solution
- @Risk Binomial Function to simulate random population of the boxes
- Run simulation to see the difference between:
  - **Stick** with original choice
  - **Swap** to new choice

# The logic of the empty box

## Stick

£	0	0
0	£	0
0	0	£



1:3 chance  
to win

## Swap

£	0	0
0	£	0
0	0	£

2:3 chance  
to win



# Decision Bias



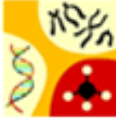
1. Perception error
2. Past experience
3. Relativity bias
4. **Counter-intuition**

# The 3 Coin toss



- What is the probability that 3 coins tossed together will all come up Heads?
  - $0.5 \times 0.5 \times 0.5 = 0.125$
- Suppose now we increase the risk
  - For each coin, there is a 3<sup>rd</sup> option:
  - The coin is dropped
  - Dropped coins don't count

# 3 Coin toss with risk

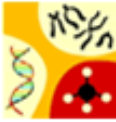


	P drop
Coin 1	0.2
Coin 2	0.1
Coin 3	0.3

Dropped coins don't count!

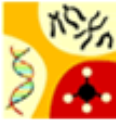
What is the probability of 3 Heads coming up together?

# Decision Bias



1. Perception error
2. Past experience
3. Relativity bias
4. Counter-intuition
5. Hasty generalisation / Frequency judgement

# The certain equivalent



**£X**

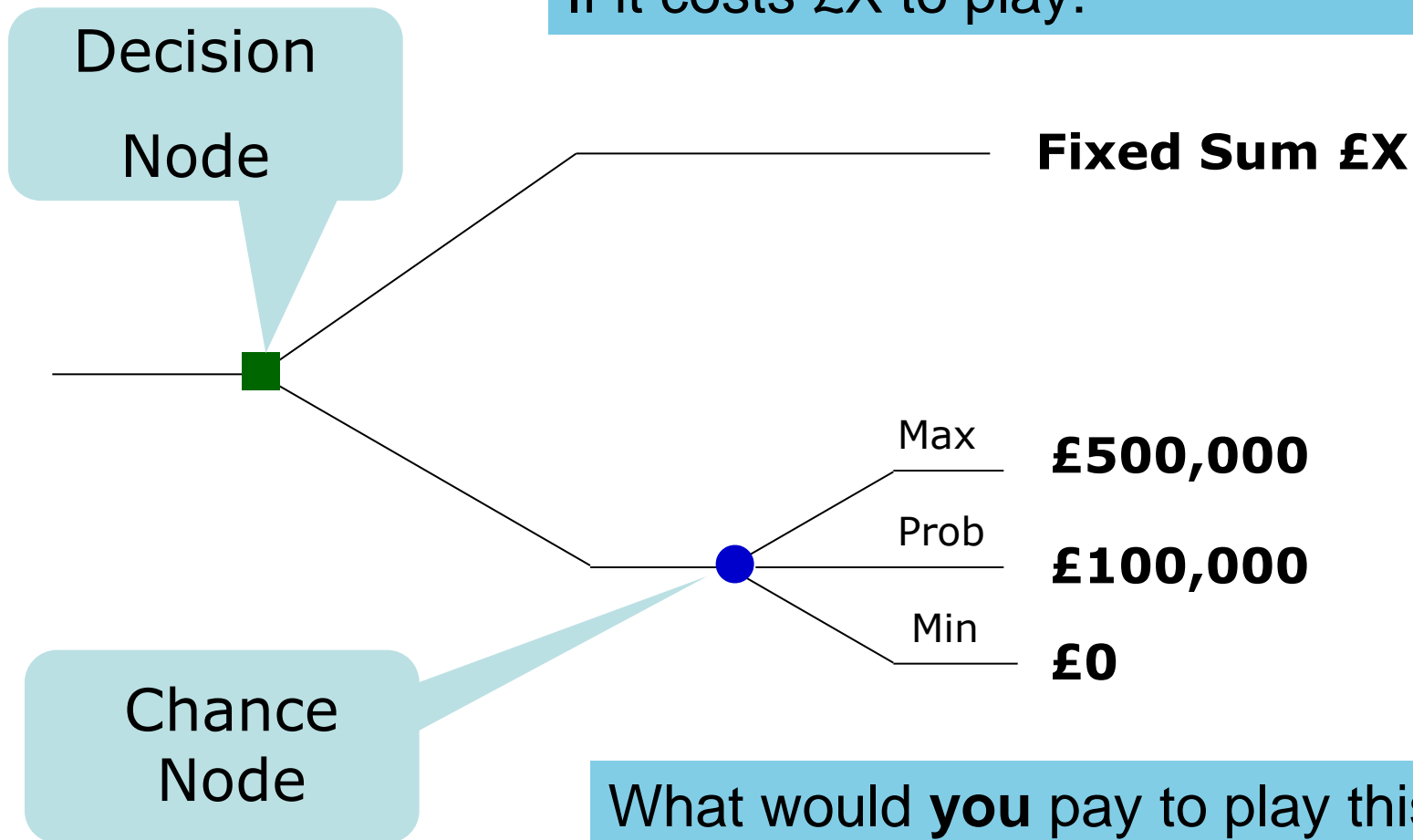
*or*



For what value of X are you indifferent between:  
a fixed sum *or* playing a game of chance?

# Investment option

If it costs £X to play:



What would **you** pay to play this game?

# Decision Bias

1. Perception error
2. Past experience
3. Relativity bias
4. Counter-intuition
5. Hasty generalisation / Frequency judgement
6. Risk Aversion

# Disease epidemic

- A disease epidemic is expected which will kill 600 people
- There are 2 program choices:
  - **Program A**
    - **Save 200 people**
  - **Program B**
    - **Save all 600 with  $P = 0.33$**

Which Program would **you** choose?

# Disease epidemic



- A disease epidemic is expected which will kill 600 people
- There are 2 program choices:
  - **Program C**
    - 400 people die
  - **Program D**
    - No deaths with  $P = 0.33$

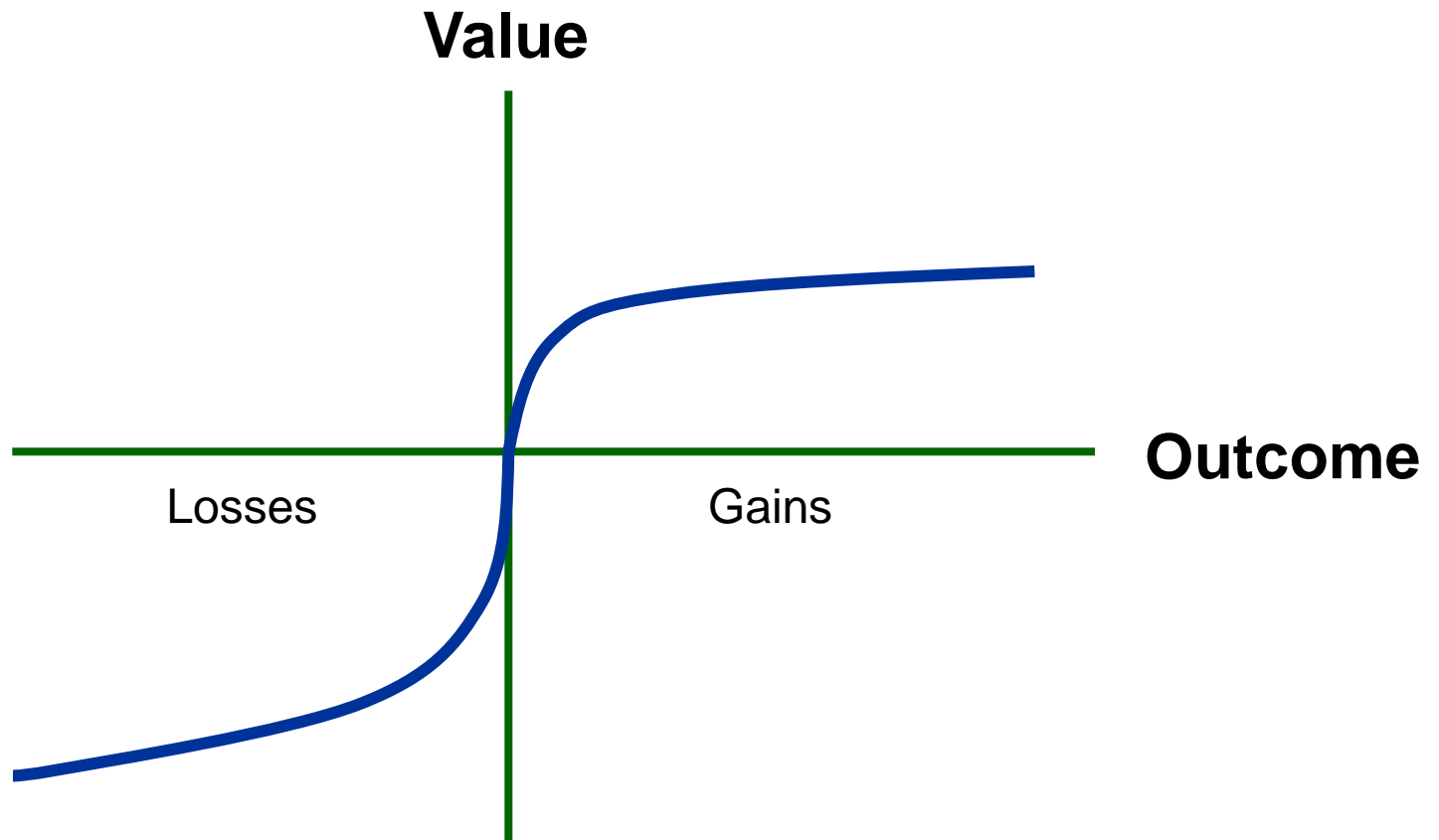
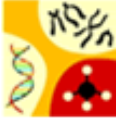
Which Program would **you** choose?

# Purchasing decision

- You have to buy new equipment, of which there are 2 models:
- **Option A:**
  - Cost is £400k
- **Option B:**
  - Cost is £600k
  - A government grant is available towards the cost
  - The probable grant is £200k
  - The max and min grant values are £400k and £100k

Which option would **you** choose?

# Loss aversion



Kahneman and Tversky (1979), *Prospect Theory*

# Decision Bias

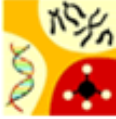
1. Perception error
2. Past experience
3. Relativity bias
4. Counter-intuition
5. Hasty generalisation / Frequency judgement
6. Risk aversion
7. **Loss aversion**



Nothing is so difficult as not  
deceiving oneself

Ludwig Wittgenstein, *Culture and Value*

# Contact



## Chris Brand

e: [cmb@captum.com](mailto:cmb@captum.com)

t: +44 (0) 115 988 6154

m: +44 (0) 7980 257 241

## Michael Brand

e: [mjb@captum.com](mailto:mjb@captum.com)

t: +44 (0) 115 988 6154

m: +44 (0) 7800 829 012

## Captum Capital Limited

Cumberland House

35 Park Row

Nottingham NG1 6EE

United Kingdom

[www.captum.com](http://www.captum.com)