Financial and Economic Modelling for Business and Government

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pwc

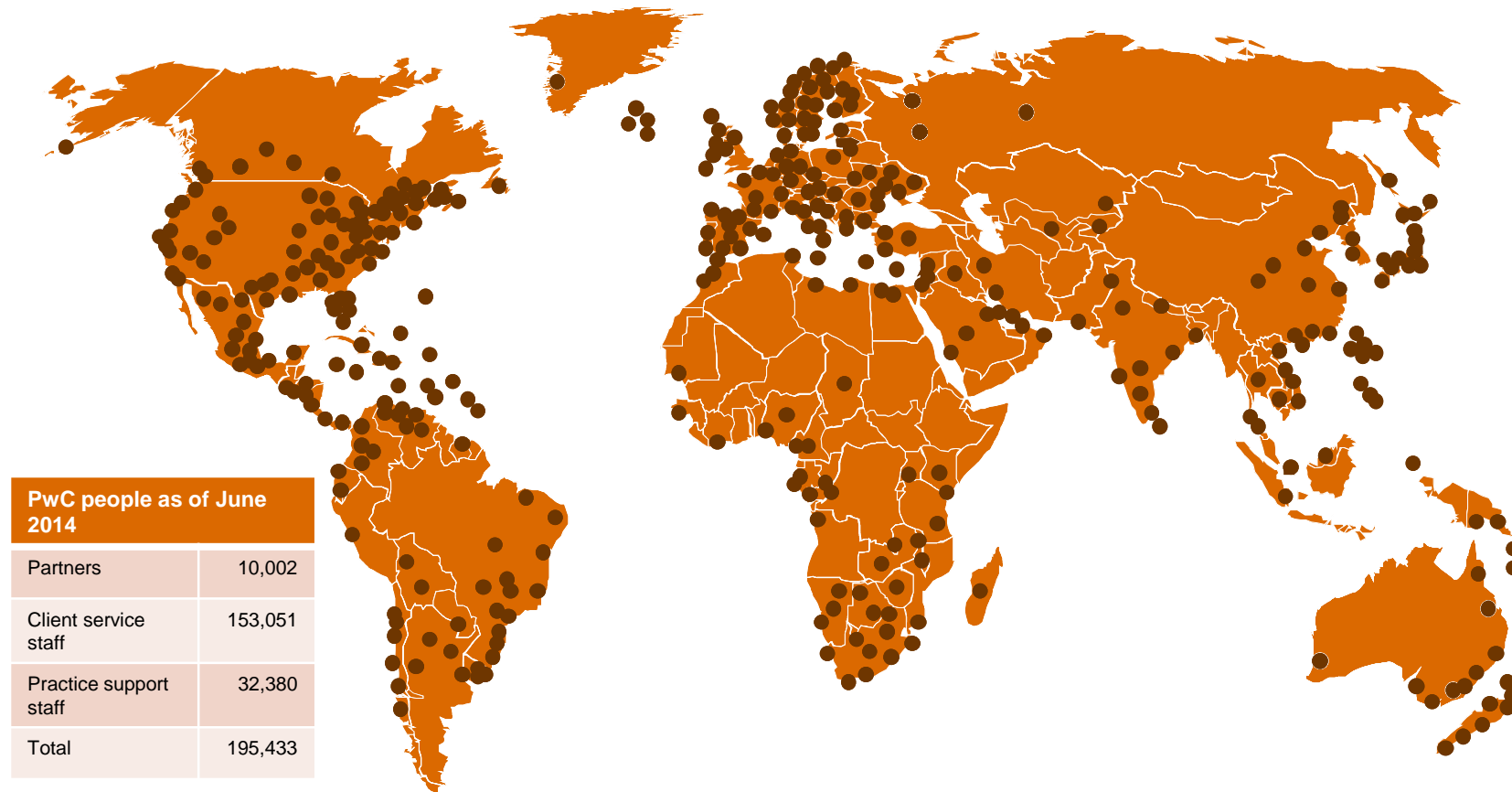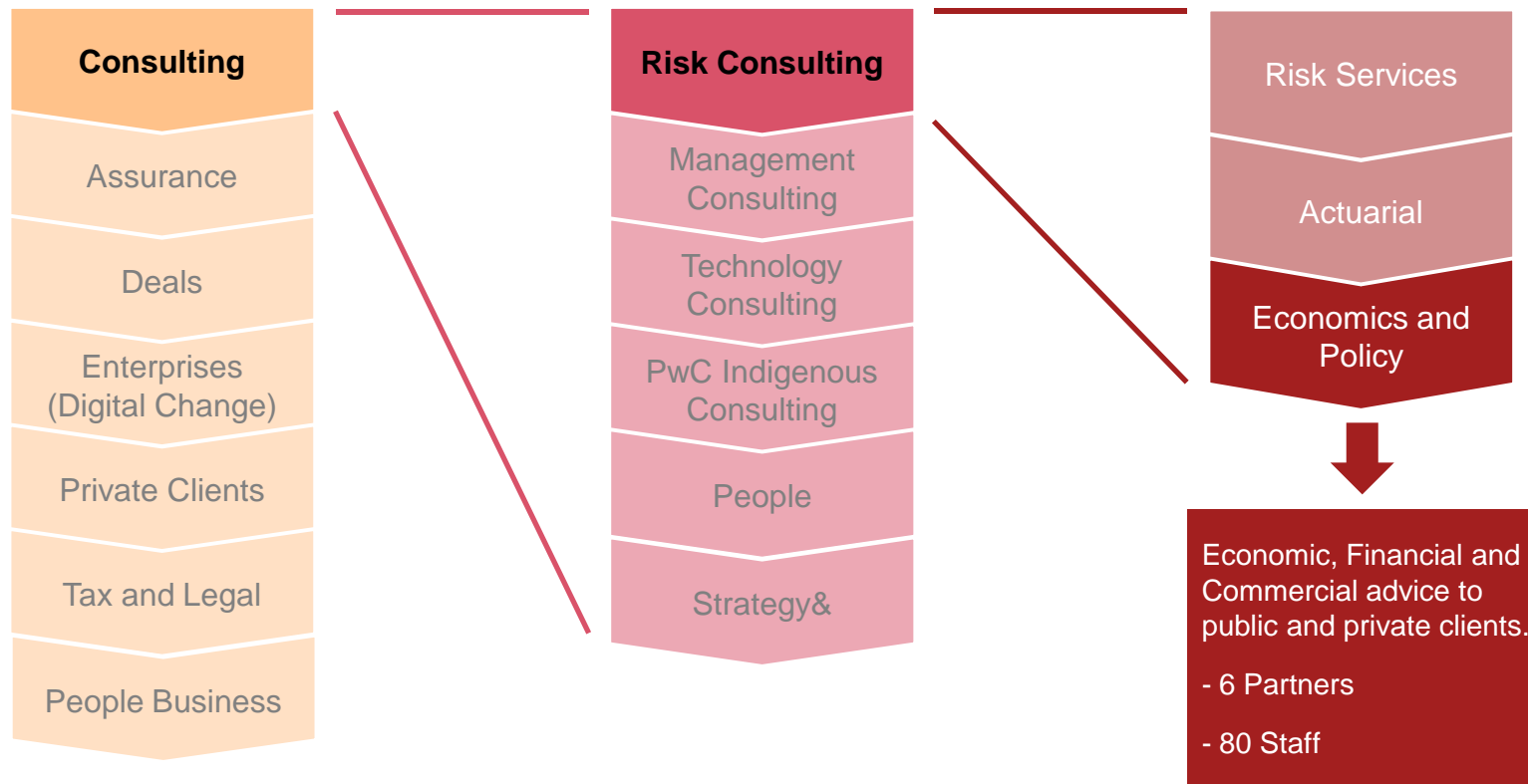# *Presentation for today*

PwC

Our Approach

Discussion of Examples

PwC

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PwC

PwC is a network of firms with offices in 758 locations in 157 countries.

PwC people as of June 2014	
Partners	10,002
Client service staff	153,051
Practice support staff	32,380
Total	195,433

PwC Australia

PwC Australia is one of Australia's leading professional services firms, with over 6,000 employees in offices around the country .

Consulting
- Assurance
- Deals
- Enterprises (Digital Change)
- Private Clients
- Tax and Legal
- People Business

Risk Consulting
- Management Consulting
- Technology Consulting
- PwC Indigenous Consulting
- People
- Strategy&

Risk Services

Actuarial

Economics and Policy

Economic, Financial and Commercial advice to public and private clients.

- 6 Partners

- 80 Staff

PwC Australia
...and me

Now

Joined PwC in 2000, with a focus on economic, financial and commercial analysis and advice

Partner in the Australian firm, leading our

- Economics and Policy services nationally
- Government advisory services in Queensland

Before

Commercial, regulatory and economic advisory positions for both Commonwealth and State Government organisations
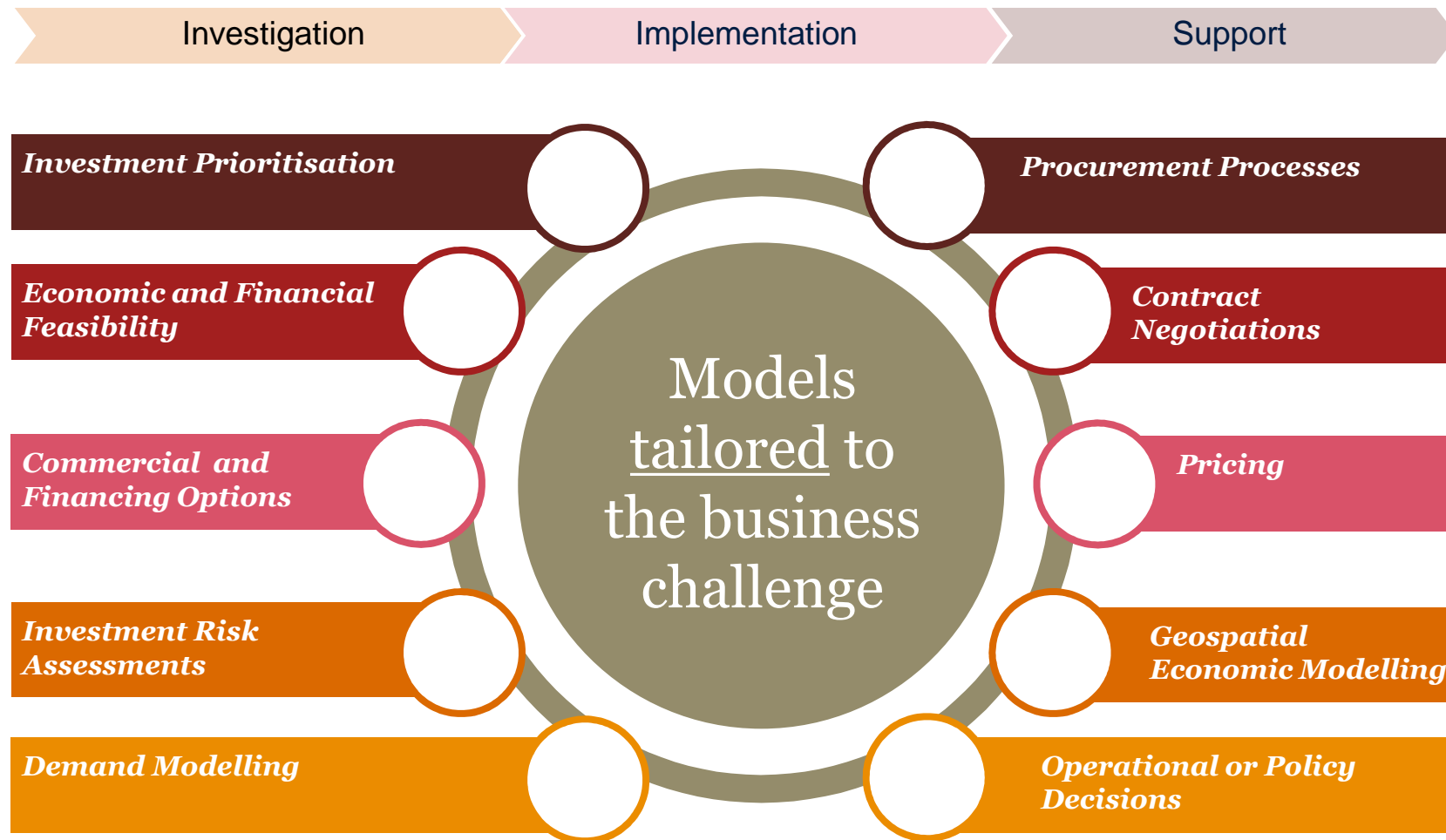
Our Approach

2

A means to an end

Keep perspective

- Economic and financial models are <u>tools</u> to support critical business decisions.

- Before modelling:
    - understand the 'question'
    - identify where quantitative analysis 'fits in'

- During/after modelling:
    - interpret in context
    - be clear on the limitations

- Rarely a standalone deliverable

What is the 'question'?
- Project definition
- Client engagement
- Options definition

How is it best 'answered'?
- Qualitative or quantitative
- Data availability
- Model scoping

Deliver and interpret
- Build model
- Testing and review
- Analysis and reporting

Models to suit a client's requirements

Investigation	Implementation	Support

Investment Prioritisation

Economic and Financial Feasibility

Commercial and Financing Options

Investment Risk Assessments

Demand Modelling

Procurement Processes

Contract Negotiations

Pricing

Geospatial Economic Modelling

Operational or Policy Decisions

Models tailored to the business challenge

Let's Discuss

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Model type
Investment prioritisation
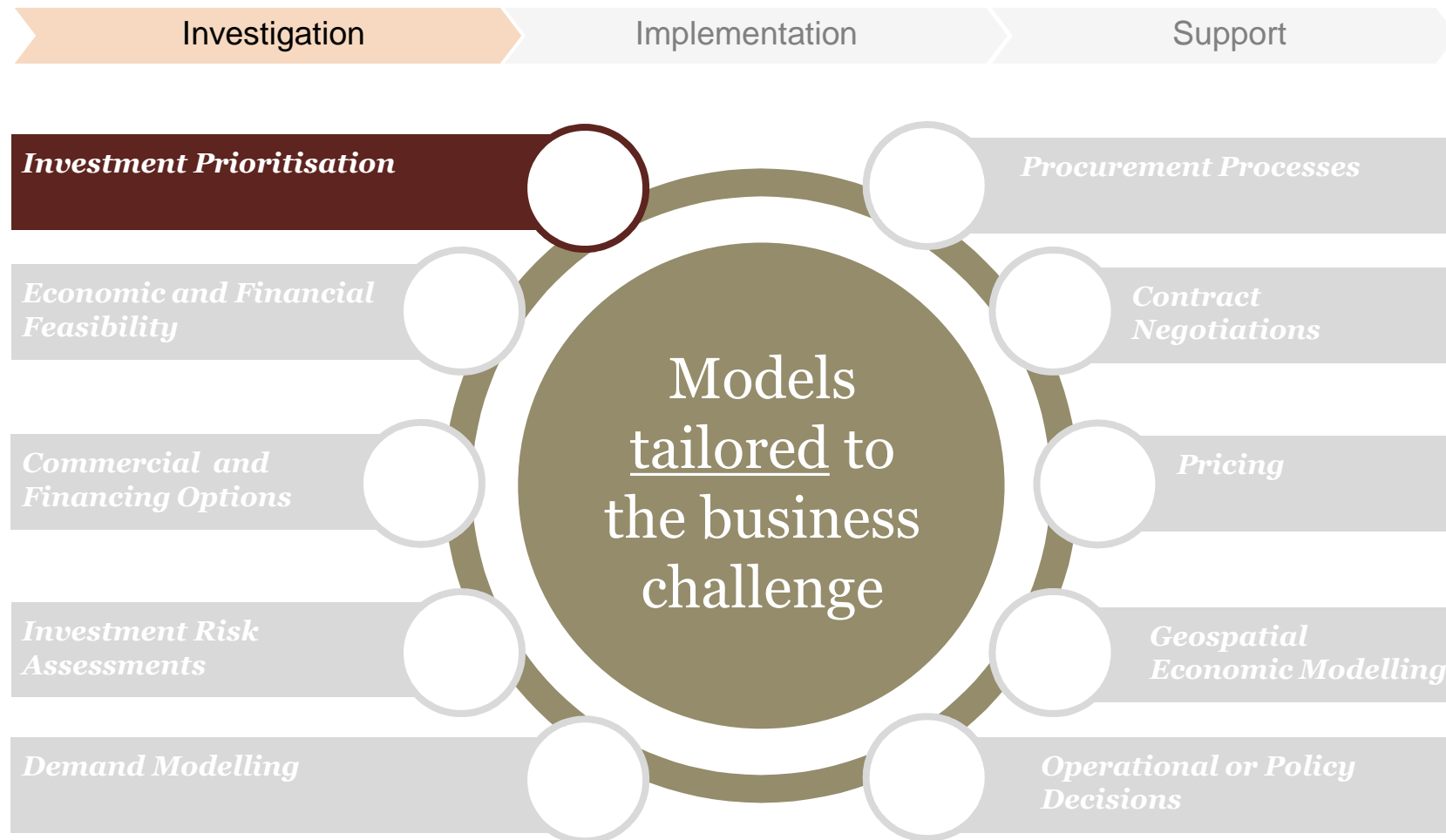
Investment prioritisation
Overview

Business Issue

Public resources are limited and always have alternative uses - a new project or policy means reallocation of these resources. Governments must determine if this re-allocation is likely to make a net contribution to society.

Government clients or projects

Private Sector clients or projects
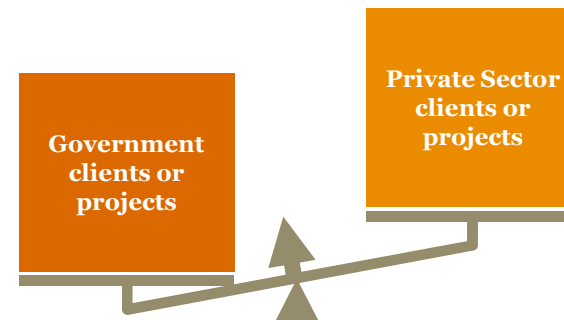
Model Characteristics

- Equity/distributional factors are irrelevant
- Focus is on marginal changes in markets for the outcomes from a project/policy
- Need to ensure that the reallocation of resources targets the problem not the symptoms
  - is traffic congestion due to insufficient capacity (engineering) or inefficient use (demand management)?

Risks and Challenges

- Pricing the intangible benefits of a project
- Accounting for uncertainty of outcomes, and forecasting future cash flows reasonably
- Discounting future costs and benefits appropriately
- Ensuring all options to address issue are evaluated

Investment prioritisation
## Example

Project

South West Rail Link

High residential growth area in South West Sydney required transit improvements to link to the city centre. Cost-benefit analysis model developed to evaluate four different options.

Modelling Task

A detailed model was developed to evaluate the relative merits of providing additional bus services, or combination of rail and road infrastructure.

Benefits modelled included:

- De-crowding, ambience and reduced standing travel times

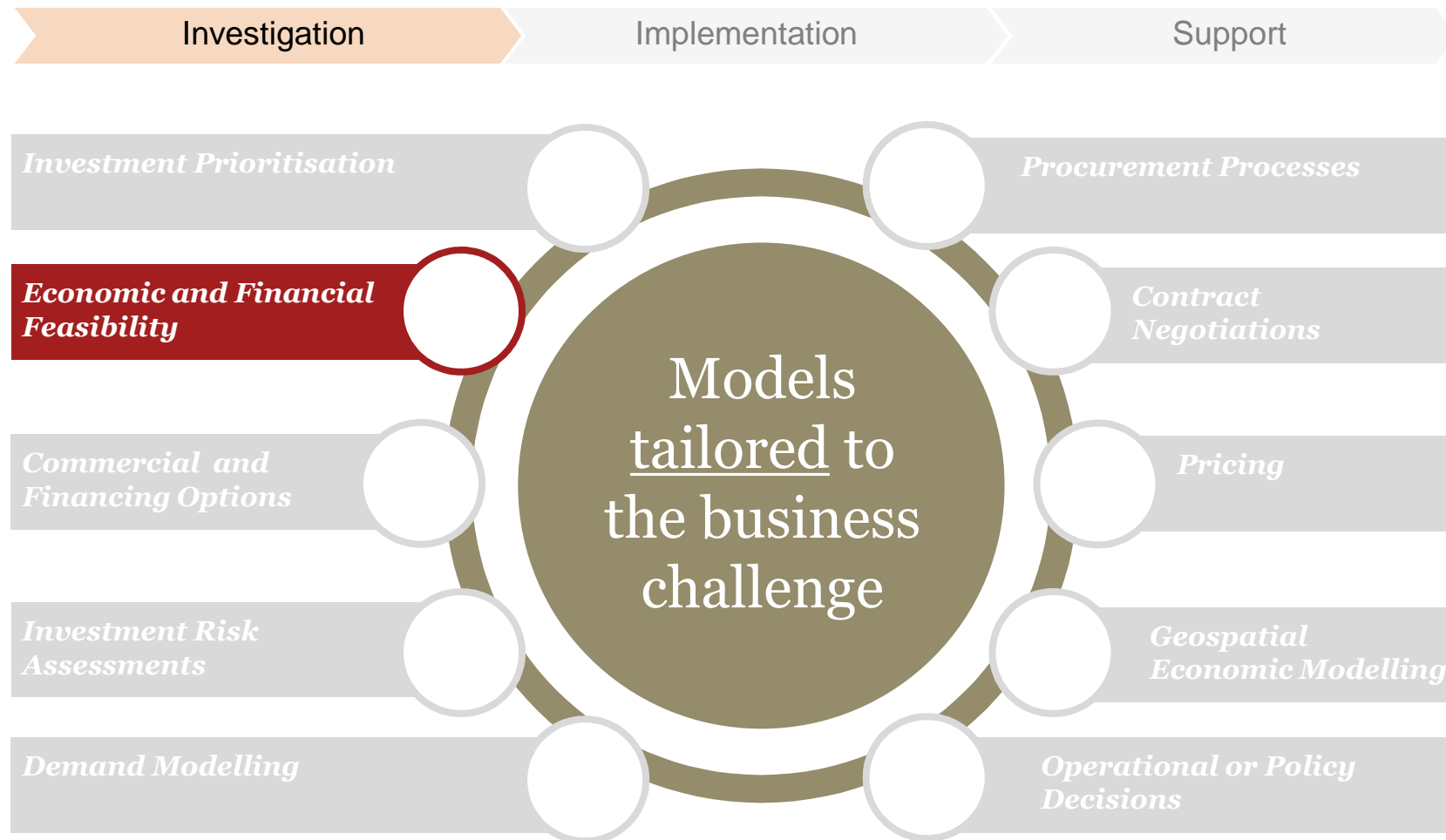- Environmental benefits

- Increased workforce productivity
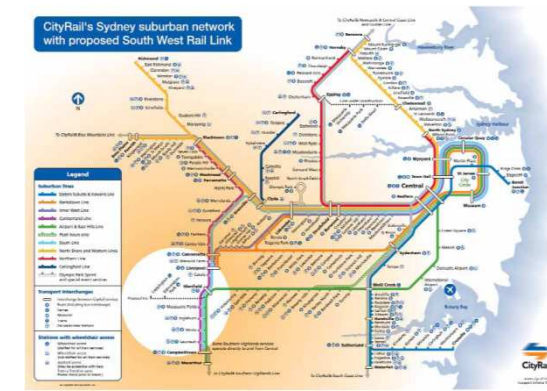
Key Challenges Managed

- Broad literature review to identify appropriate valuations of intangible benefits

- Consulted with multiple stakeholders to develop an appropriate set of project options

- Scenario / simulation analysis undertaken to understand how model parameters affect ranking of options

Model type
Economic and financial feasibility

| Investigation | Implementation | Support |

Investment Prioritisation

Economic and Financial Feasibility

Commercial and Financing Options

Investment Risk Assessments

Demand Modelling

Models <u>tailored</u> to the business challenge

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Operational or Policy Decisions

Economic and financial feasibility
Overview

Business Issue

Investigate alternative investment or policy options to estimate comparative:

- affordability / funding requirements
- financial performance
- economic impacts
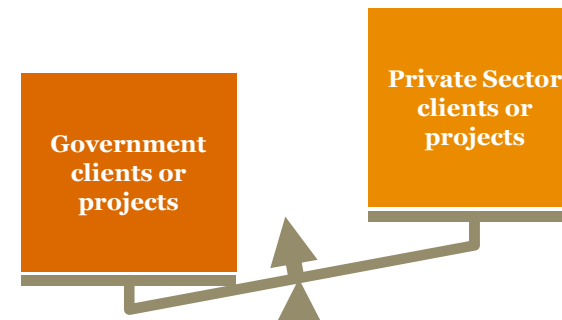
Model Characteristics

- Need clear definition of alternative options or scenarios
- Require high levels of flexibility and 'sensitisation'
- Heavy dependence on forecasts
- Relatively low levels of detail
- Prefer ranges to 'single point' results

Risks and Challenges

- Functionality requirements can change as options and scenarios 'evolve'
- Preliminary model outcomes can 'feedback' into revised options or scenarios
- Format and structure of key inputs often unclear until late in model development
- Avoiding undue reliance on quantitative outputs

Economic and financial feasibility
Example

Project

Gold Coast Rapid Transit Project

Develop a Business Case to compare value for money of alternative options for improving north-south public transport services on the Gold Coast.

Modelling Task

A highly flexible model was developed to forecast the net financial cost to the Queensland Government comparing:

- rapid bus vs. light rail infrastructure options
- alternative corridors
- scheduling of up to five project stages
- patronage and cost scenarios
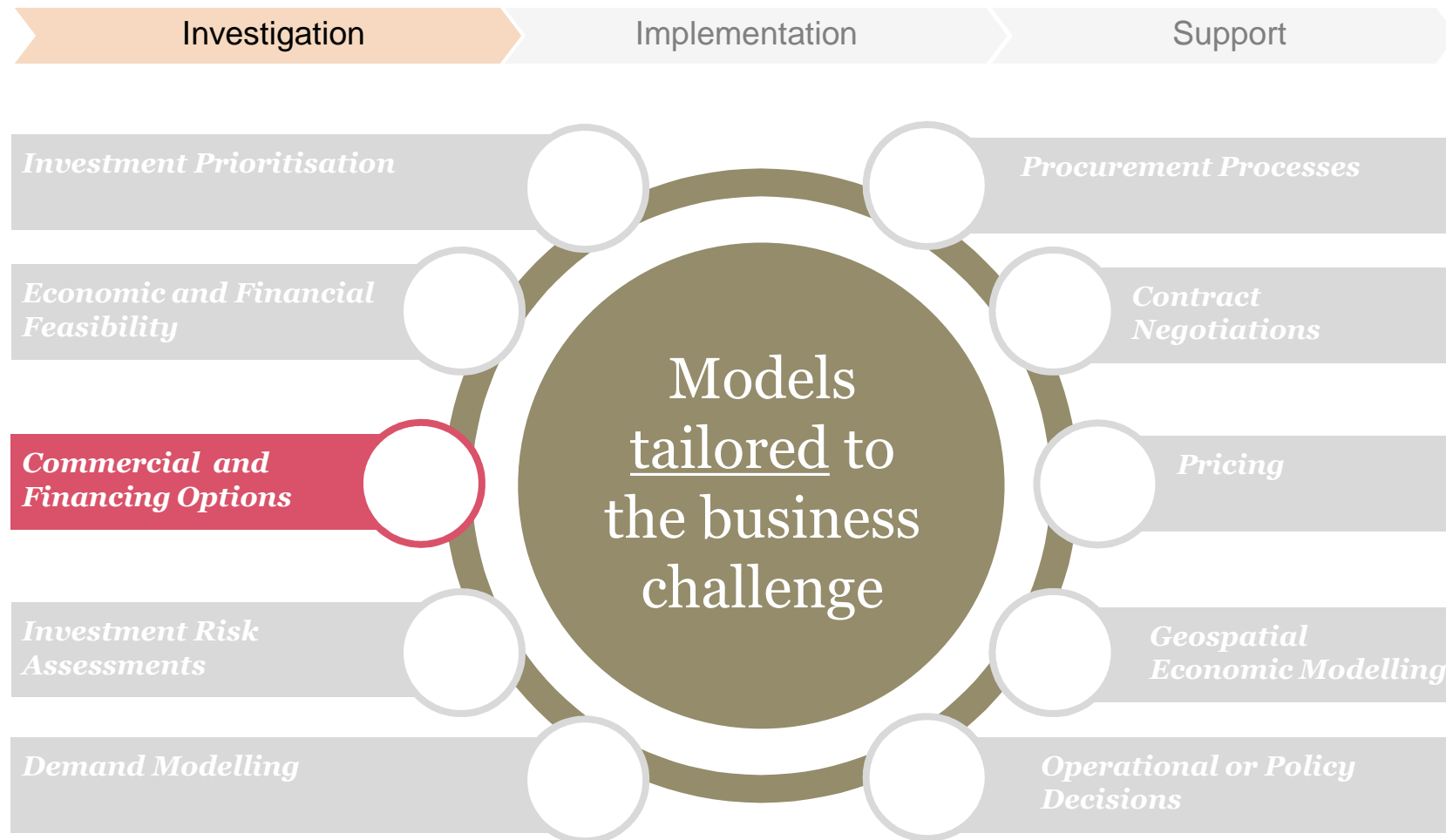- private delivery and financing options

Key Challenges Managed

- Multiple permutations of staging, corridor and design (e.g. station location) options
- Joint funding involvement of the Federal, State and Local governments, requiring
  - consensus on scenarios and assumptions
  - inconsistent analysis requirements
- Potential misinterpretation of key financial principles by analysis recipients

Model type
Commercial and financing options

Investigation	Implementation	Support

Investment Prioritisation

Economic and Financial Feasibility

Commercial and Financing Options

Investment Risk Assessments

Demand Modelling

Models <u>tailored</u> to the business challenge

Procurement Processes

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Geospatial Economic Modelling

Operational or Policy Decisions

Commercial and Financing Options
Overview

Business Issue

Investigate options for the commercial structuring and/or financing of an investment:

- ownership structure and responsibilities
- contractual / pricing arrangements
- debt and equity structures

Government clients or projects

Private Sector clients or projects
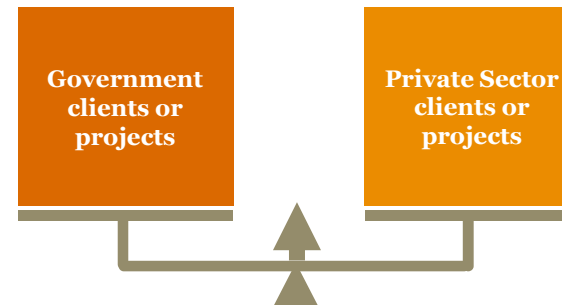
Model Characteristics

- Close interaction with legal and tax advisers
- Requires 'allocation' of project-level forecasts between multiple investors / financiers
- Need clear definition of alternative options or scenarios
- Financing structures can be complex and based on strict prioritisation of cash flow 'claims'

Risks and Challenges

- Logic requirements can change as detailed tax, structuring or financing arrangements are refined or redefined
- Require strong communication between model developer and parties defining commercial and financing strategies
- Potential for high complexity (or error) where there is a high number of permutations of possible commercial / financing outcomes

Commercial and Financing Options
Example

Project

LNG Value Train

Support a client investigating optimisation of value of gas reserves, through options for participation in an integrated LNG project proposal.

Modelling Task

Develop models covering the full value chain of an integrated Upstream – Midstream LNG project to calculate:

- tariffs for access to third party infrastructure
- transfer prices for LNG plant and pipeline components
- pricing for upstream gas and condensate
- JV participation rates in each component
- Government participation, taxes and levies

Key Challenges Managed

- 'Dynamic' modelling in an environment of preliminary project definition and options identification
- Integrating upstream and midstream elements of analysis
- Allocating value under different participation rates (ownership shares) for multiple assets
- Identifying gas monetisation (tax) points and allocation of historical 'tax pools'

Model type
Investment risk assessments
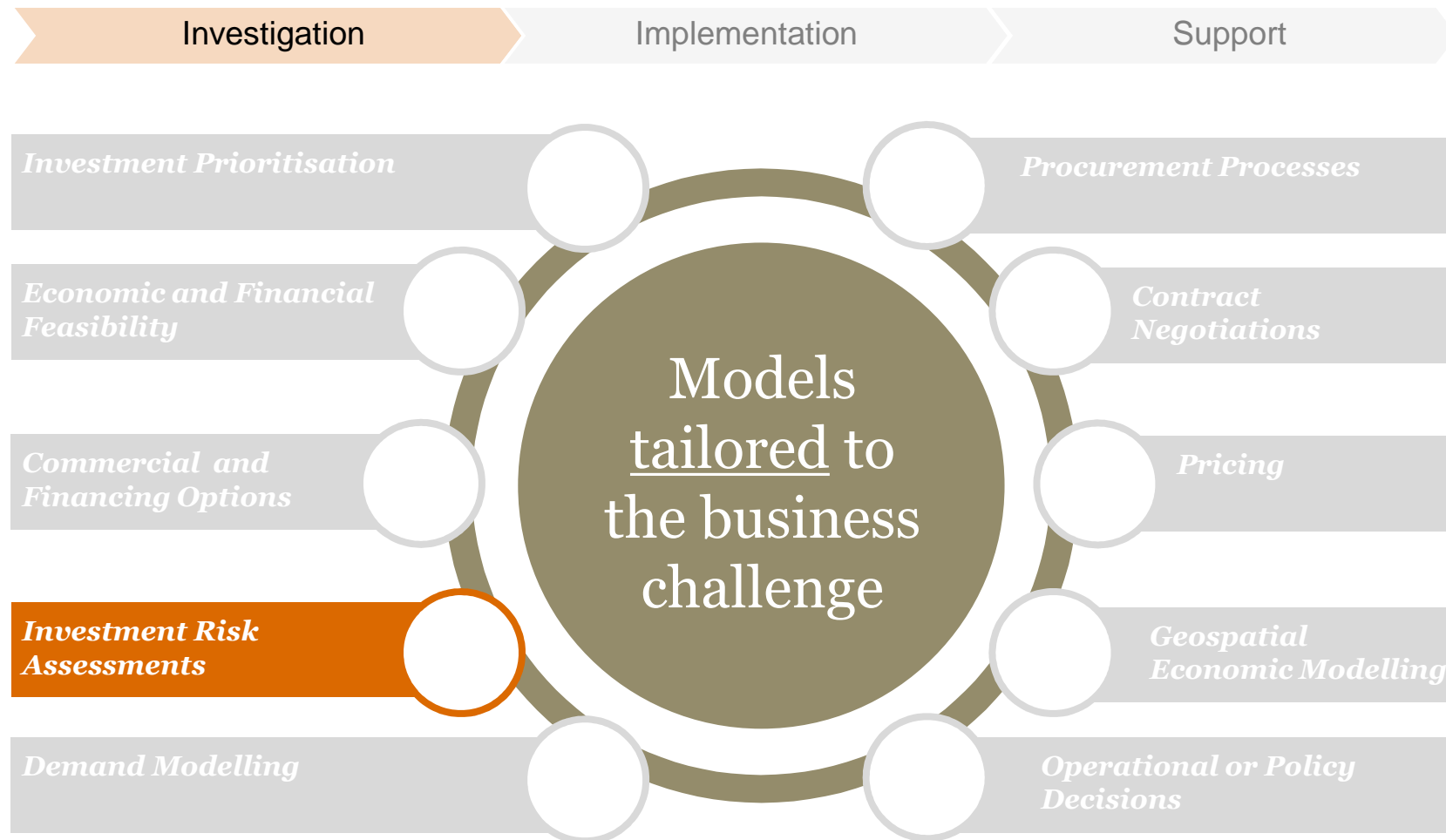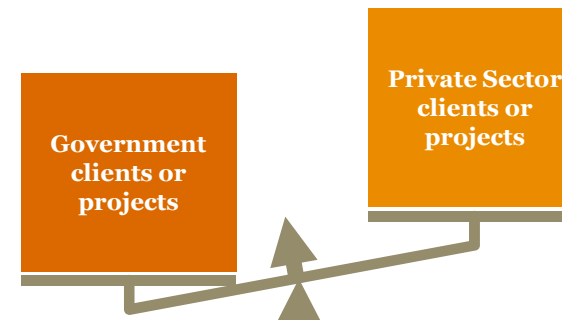
Investment risk assessments
Overview

Business Issue

Understand the probability of future outcomes in circumstances of risk or uncertainty, using relevant statistical measures (e.g. mean, mode, confidence intervals, etc).

Better understand and prioritise risks.

Government clients or projects

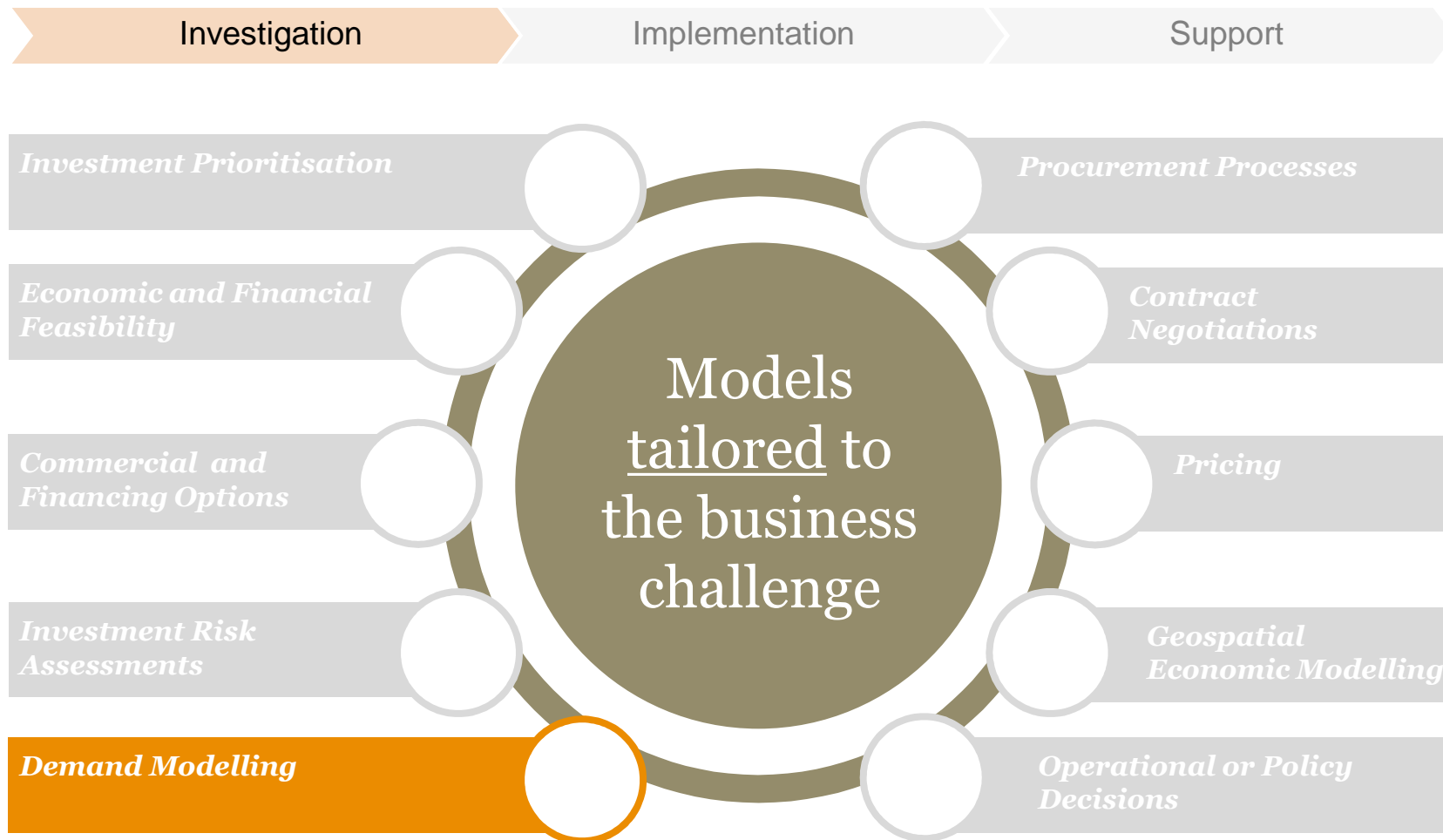Private Sector clients or projects

Model Characteristics

- Typically based on 'unrisked' models, or included as additional functionality
- Rely on Excel 'add-ins' such as "@Risk" or "Crystal Ball"
- Require definition of the probability of uncertain events, and the distributions of risk impacts
- Runs multiple (e.g. 10,000) randomised iterations for defined events

Risks and Challenges

- Requires understanding of specialised functions in Excel
- If risk or uncertainty cannot be reasonably defined, analysis outcomes will be unreliable
- Ensuring appropriate interpretation of statistical results
- Extensive application in very large models can cause extended 'run' or iteration times

Model type
Demand modelling

Investment Prioritisation

Economic and Financial Feasibility

Commercial and Financing Options

Investment Risk Assessments

Demand Modelling

Models <u>tailored</u> to the business challenge

Procurement Processes

Contract Negotiations

Pricing

Geospatial Economic Modelling

Operational or Policy Decisions

Demand modelling
Overview

Business Issue

Understand the drivers of demand for individual products and services, in order to:

- assess the effects of new taxes or tariffs, or measure responses to price changes
- prioritise product introduction
- forecast capital and operating expenditure

Government clients or projects

Private Sector clients or projects

Model Characteristics

- Trade-off between model 'richness', and ease of computation, testing, and communication to others.
- Although complex technical criteria are available to evaluate models, model selection often based on more subjective criteria.
- Demand drivers for the same product or service may vary significantly between market segments.
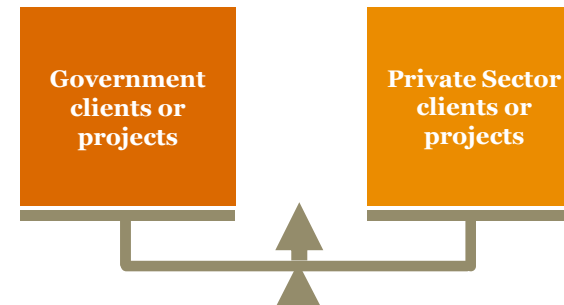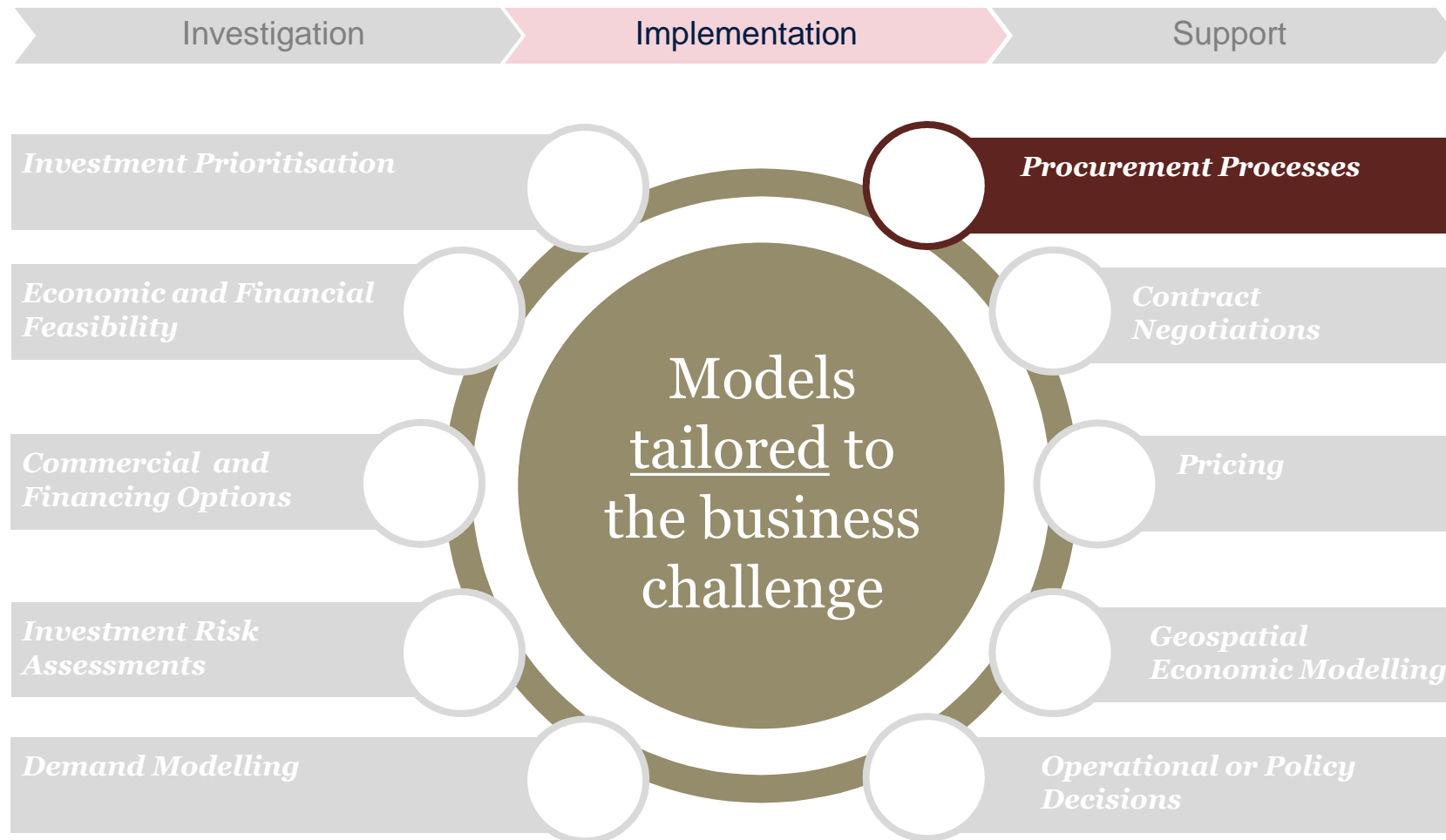
Risks and Challenges

- Data may not be available to estimate the ideal theoretical model
  - Not granular enough, or periodicity of the data is too infrequent
- Possible that strong statistical relationships between variables may not be identified
- A good fit to sample data may not guarantee accurate forecasts when fitting model to new data

Model type
Procurement processes

Investigation	Implementation	Support

Investment Prioritisation

Procurement Processes

Economic and Financial Feasibility

Contract Negotiations

Commercial and Financing Options

Models <u>tailored</u> to the business challenge

Pricing

Investment Risk Assessments

Geospatial Economic Modelling

Demand Modelling

Operational or Policy Decisions

Procurement processes
## Overview

Business Issue

Evaluate competing bids for the provision of requested services or assets

  OR

Develop and submit bids for the provision of requested services or assets

Government clients or projects

Private Sector clients or projects

Model Characteristics

- Focused on a lower number of project options
- Relatively high levels of detail, supporting 'firm' pricing of services
- Based on detailed quotes, commitments, underwriting, etc
- Supported by detailed independent review
- Supports 'contract close' and 'financial close'
- Tax structures and pro-forma accounts
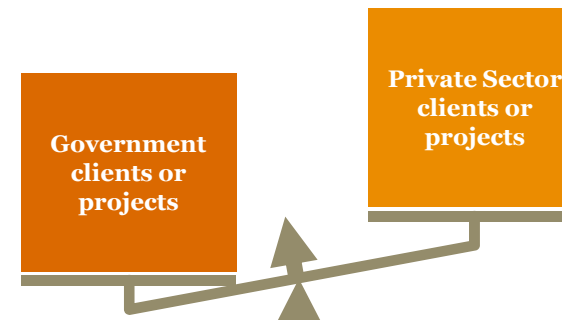
Risks and Challenges

- Models developed or evaluated in a 'high pressure' situation (e.g. time constraints)
- Errors can be 'locked in' through the bidding process
- Model output formats to align to precise bid information requirements
- Intellectual Property – models provided / received as part of submitted bid materials

Procurement processes
Example

Project

Property Development - Brisbane

Financial and commercial advice for a bidder submitting a competitive proposal to the Queensland Government for a major central Brisbane property redevelopment.

Modelling Task

A flexible and detailed model was developed within a very constrained timeframe to support analysis of bid structuring and pricing options:

- multiple precinct urban design strategies
- different realisable property product outcomes and pricing
- different JV ownership by development asset
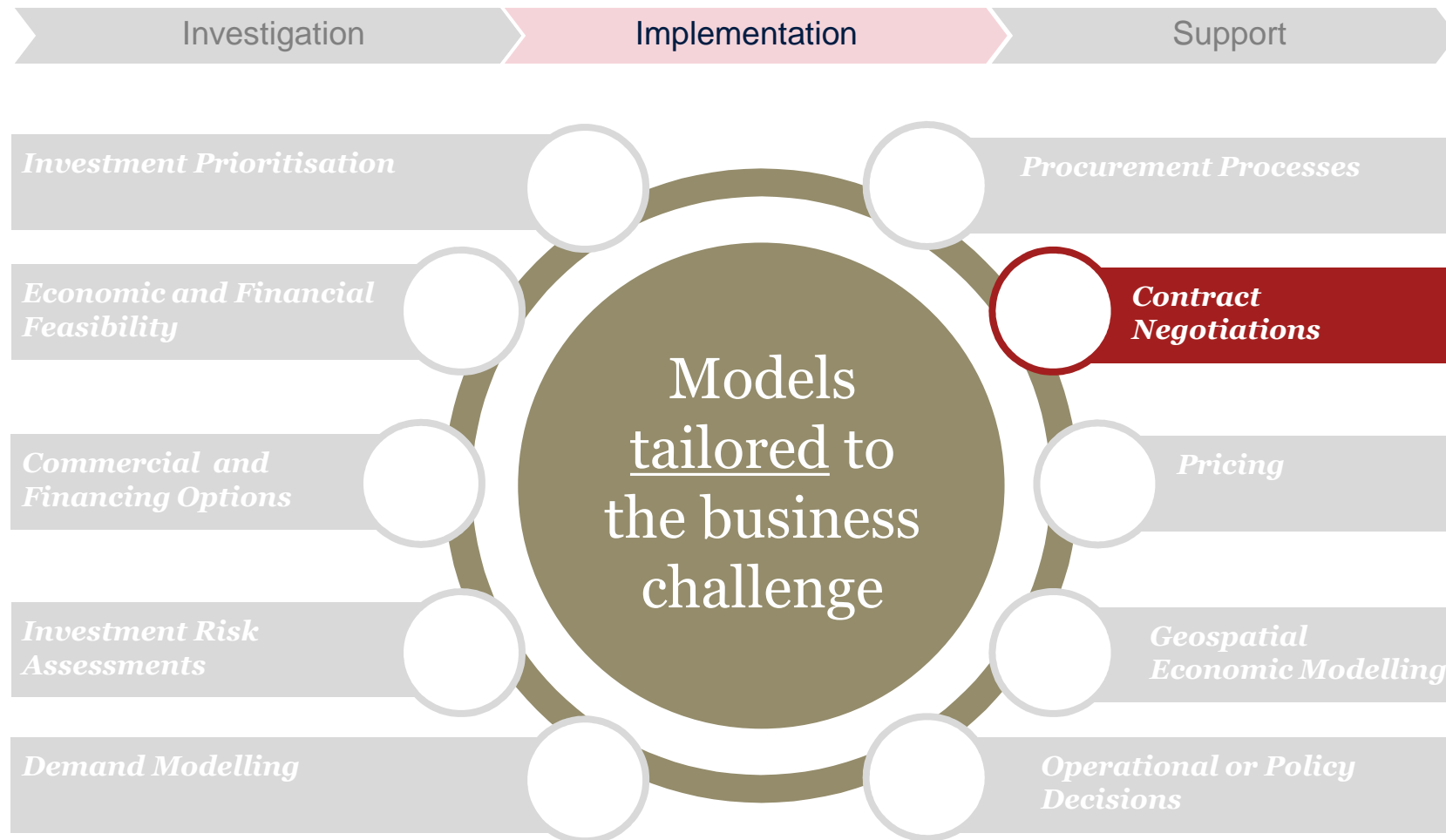- funding public realm (cross-subsidisation)

Key Challenges Managed

- Constrained development timeframes
- Commercial and financing structures not resolved until 'test run' phase of modelling
- Bid consortium participants with differing investment strategies
- Ambiguous financial information requirements in bid documentation
- Fully developed pro forma accounts including development financing, GST accounts, etc

Model type
Contract negotiations and support

Investigation	Implementation	Support

Investment Prioritisation

Procurement Processes

Economic and Financial Feasibility

Contract Negotiations

Commercial and Financing Options

Pricing

Models <u>tailored</u> to the business challenge

Investment Risk Assessments

Geospatial Economic Modelling

Demand Modelling

Operational or Policy Decisions

Contract negotiations and support
Overview

Business Issue

Understand the financial implications of different negotiating strategies or proposed clauses in legal agreements, such as:

- pricing structures
- penalty provisions
- termination payments

Model Characteristics

- Tailored to a specific project or commercial situation
- Needs to precisely align with the financial logic and methodology represented in contract provisions, or 'heads of agreement'
- High transparency and capability for reconciliation to specific contract provisions
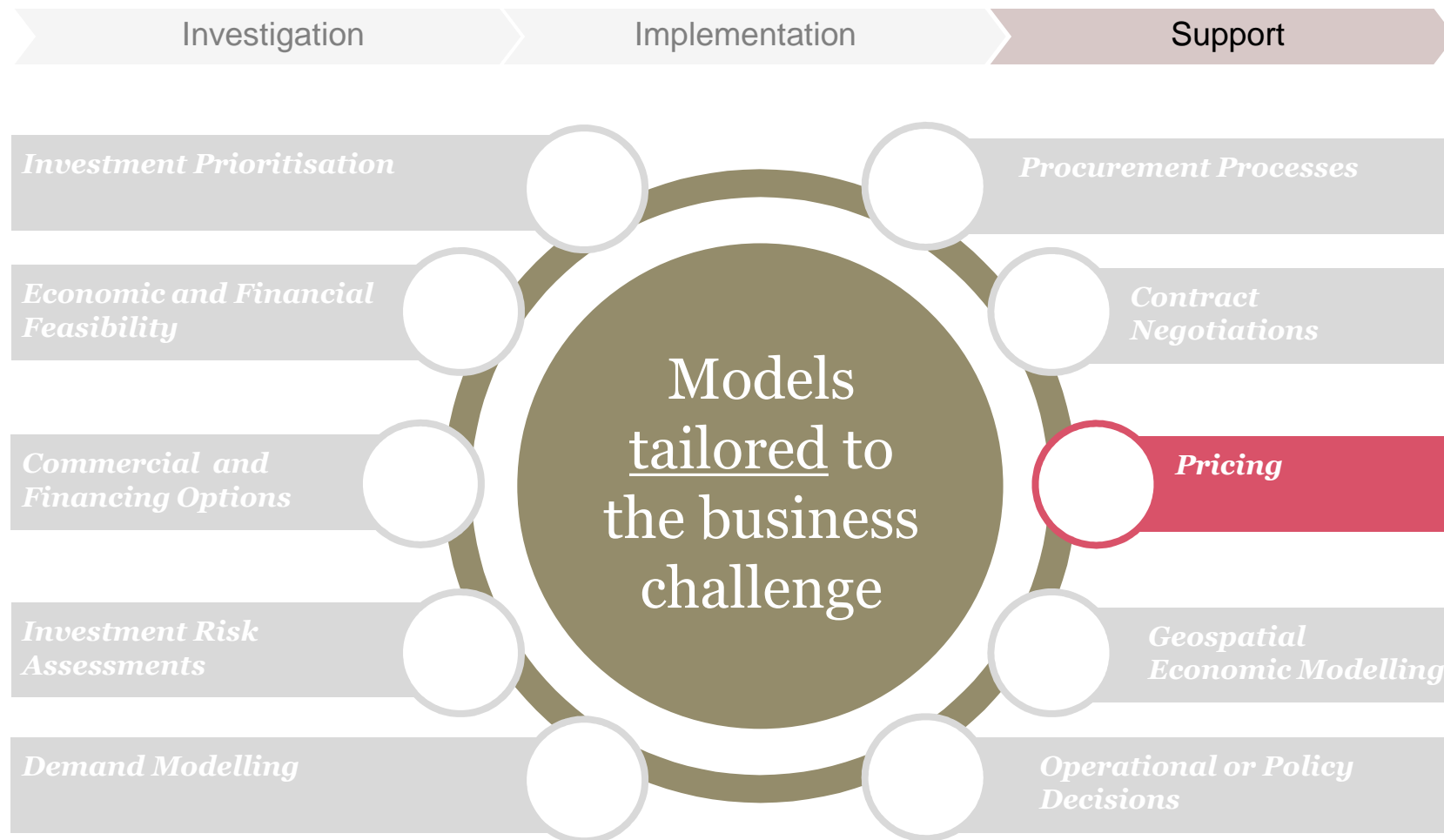- May require capability to provide 'worked example' outputs for contract materials
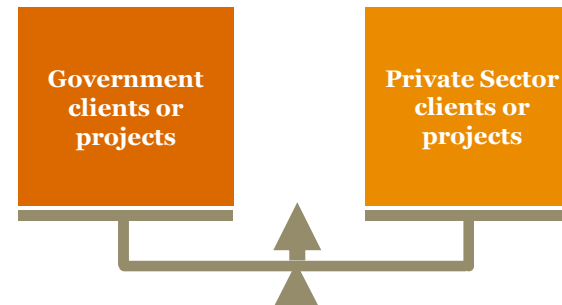
Risks and Challenges

- Clearly aligning model formula structures to discrete calculation steps reflected in contract materials (i.e. transparency)
- Identifying potential ambiguity in contract drafting (i.e. should be no methodology assumptions in the model)
- Model may be provided to contracting counterparties to support understanding of proposed commercial terms

Model type
Pricing

Investigation | Implementation | **Support**

Investment Prioritisation

Economic and Financial Feasibility

Commercial and Financing Options

Investment Risk Assessments

Demand Modelling

Models <u>tailored</u> to the business challenge

Procurement Processes

Contract Negotiations

Pricing

Geospatial Economic Modelling

Operational or Policy Decisions

Pricing models
Overview

Business Issue

Calculate pricing or charges for services provided by a business or asset. For example:

- Regulated or 'quasi-regulated' infrastructure
- Cost recovery or sharing for joint ventures
- Transfer prices for non-arms length entities

Model Characteristics

- Based on specific pricing or charging methodologies (often contractual)
- Often reflects a mix of historical and forecast data
- May have a relatively 'long life', to be used for regular pricing 'resets' or 'true-ups'
- Often specified as being subject to disclosure to third party price/charge payers for independent review or 'audit' rights
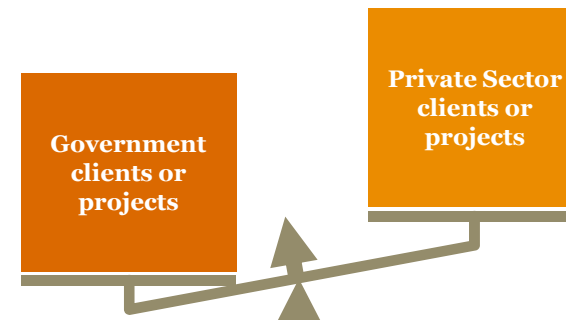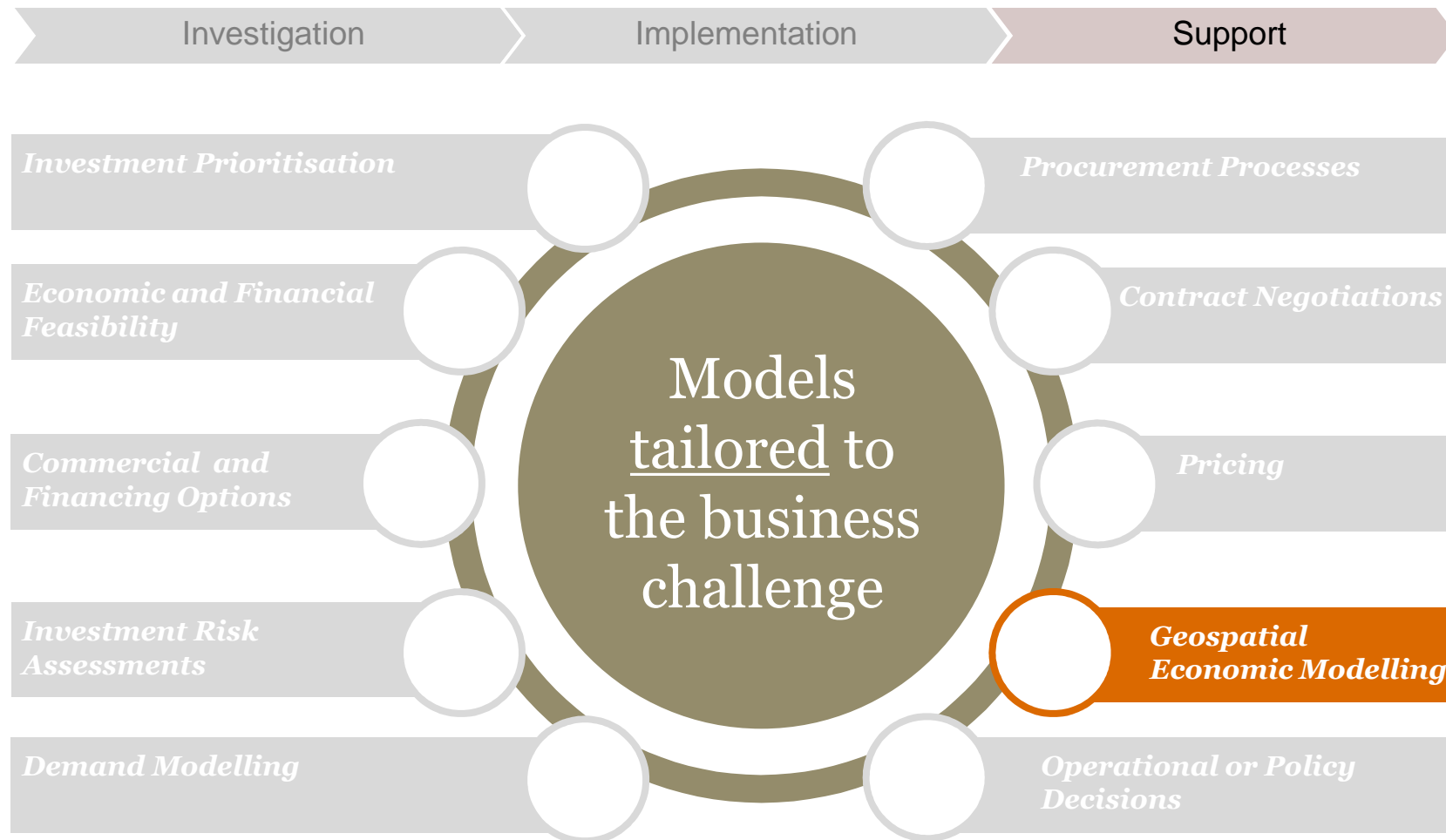
Risks and Challenges

- Model methodology must precisely (and transparently) reflect specified pricing methodologies
- Can be relatively large and complex (e.g. for large regulated infrastructure projects)
- May be highly dependent on the application of capital asset pricing theory, and subject to 'academic challenges'
- Subject to scrutiny by third parties and government regulators / taxation agencies

Model type
Geospatial economic modelling

Investigation	Implementation	Support

Investment Prioritisation

Economic and Financial Feasibility

Commercial and Financing Options

Investment Risk Assessments

Demand Modelling

Models <u>tailored</u> to the business challenge

Procurement Processes

Contract Negotiations

Pricing

Geospatial Economic Modelling

Operational or Policy Decisions

Geospatial Economic Modelling
Overview

Business Issue

Decisions are being made for local regions using state-wide or industry-level data.

- Government agencies want to understand gaps between demand and supply of services.

- Businesses are deciding the location of their next stores

Government clients or projects

Private Sector clients or projects

Model Characteristics

- Combines multiple data sets to generate holistic view of regions, including data across:
  - Economic, demographic, labour force
  - Retail, transport, industry and climate
- Provides spatially consistent data, results from granular regions sum to larger areas
- Consistent with ABS measurement and accounting methodologies
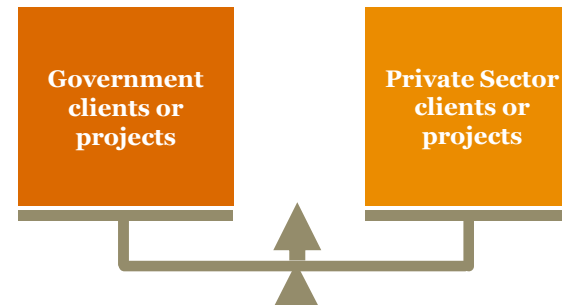
Risks and Challenges

- Requires detailed understanding of geographical mapping in data

- Technical expertise required across a range of platforms, e.g. data analysis, databases, GIS

- Managing significant volumes of data, e.g. 20 industries, 2114 locations, 15 years of data from 5 data sources

- Incorporating revisions to ABS geographical classifications

Geospatial Economic Modelling
Example

Project

Ergon Energy peak demand modelling

Ergon's state-wide peak demand forecasting model suggested growth was flat-lining in aggregate, and wanted to identify specific areas of growth in order to prioritise capital investments.

Modelling Task

Used PwC's Geospatial Economic Model to allocate historic and forecast input data used in Ergon's state-wide peak demand model to individual network regions.

Used these more detailed inputs to develop region-specific peak demand models to identify high growth areas in the network.
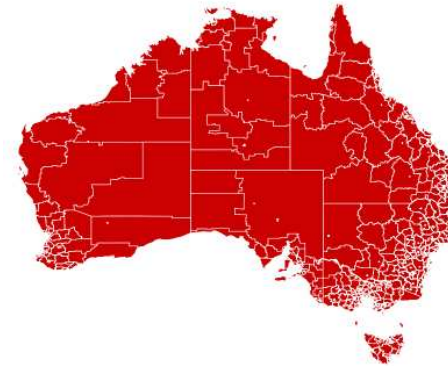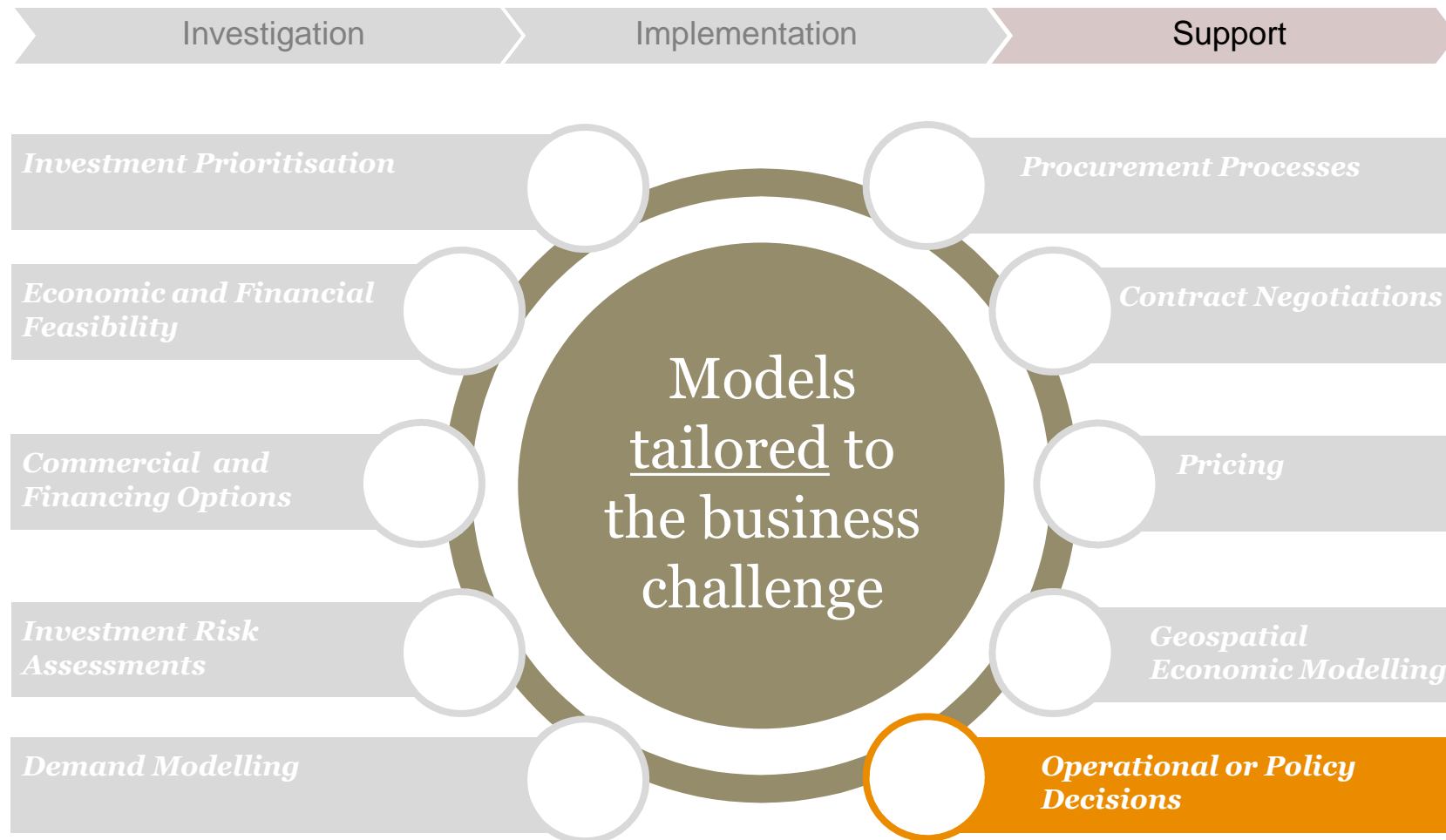
Key Challenges Managed

- Worked closely with Ergon econometricians and GIS specialists to understand forecasting methodology and map Ergon regions to ABS data

- Calibrated uncertain Geospatial Economic model parameters based on the improvements to peak demand model fit

Model type
Operational and policy decisions

| Investigation | Implementation | Support |

- Investment Prioritisation
- Economic and Financial Feasibility
- Commercial and Financing Options
- Investment Risk Assessments
- Demand Modelling

Models <u>tailored</u> to the business challenge

- Procurement Processes
- Contract Negotiations
- Pricing
- Geospatial Economic Modelling
- Operational or Policy Decisions

Operational and policy decisions
Overview

Business Issue

Support recurring or one-off business and policy decisions, such as

- cost of capital benchmarking
- business/asset valuation
- taxation or financial assistance programs

Model Characteristics

- Highly unique and tailored to a specific business, policy or financial issue
- Less likely to have any clear commonality in methodology between models of this type
- More likely to involve managing a 'mix' of forecast and historical data
- May have a relatively 'long life' where the issue to be assessed is recurring
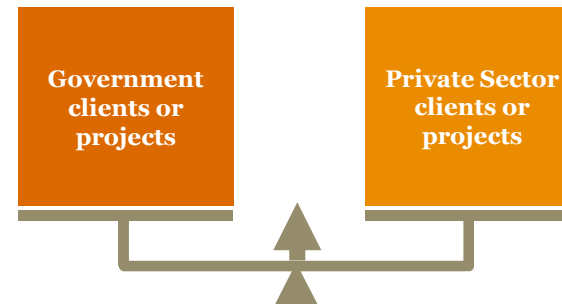
Risks and Challenges

- Ensuring consistency between data, particularly where 'blending' historical and forecast data
- Facilitating 'roll forward' of historical data where model management spans time
- Developing 'reasonable' methodologies for unstructured issues

Questions...

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