

## Modelling sub-sea broadband transmission

Since 2004, Synergies Economic Consulting has provided quality advice and delivered innovative, client-focussed solutions to the private and public sector throughout Australia. Synergies has built its reputation for timely and high quality professional advice through the expertise, skills and flexibility of a dedicated and experienced team.

What sets us apart from our competitors is the ongoing hands-on involvement of our senior professionals in all our projects. We take great pride in the quality of our work, our people, the way we work together and our ability to deliver practical solutions using sophisticated commercial and economic techniques.

We are known for our thorough approach, innovative thinking and clear communication. This has been reflected in the diverse range of specialised economic and financial modelling projects we have undertaken, including for mining, health and telecommunications clients. An example of such a project is summarised below.

### The model

Trans-ocean sub-sea broadband transmission cables are the mainstay of the international high speed communications network. They carry the huge and rapidly growing volume of international internet traffic, as well as time-critical information that supports international finance, trade and commerce.

Sub-sea broadband transmission has had a chequered commercial history. When there are many providers and excess capacity, the high fixed and low variable costs of the technology have translated into precipitous price falls and large amounts of unused fibre cable. It has taken years for the trans-Atlantic route to recover commercially.

Demand for sub-sea transmission is being driven by dramatic growth in internet traffic, in turn driven by the proliferation of web-based services, growth of high-bandwidth services, the geographical concentration of server farms and the increasing prevalence of high-bandwidth local access technologies. However, future growth is to some degree uncertain. Factors such as the growth of fibre to the home, changes in the types of services delivered, and the location of servers either remotely or locally can dramatically change expected demand for transmission services.

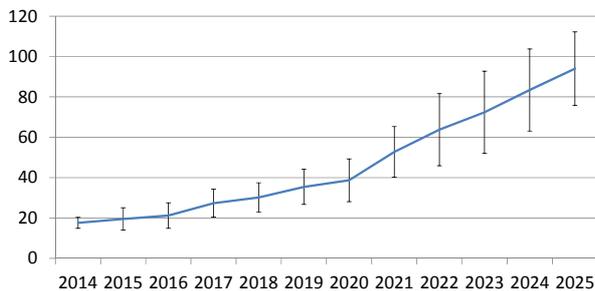
Australia is served by a number of direct trans-Pacific cables which, while capable of further expansion, are increasingly capacity-constrained. In addition, there are also a number of alternative indirect routes to the US, particularly via Asia,

although at the expense of higher latency. This oligopolistic structure means that the behaviour of individual market participants is a key determinant of market prices.

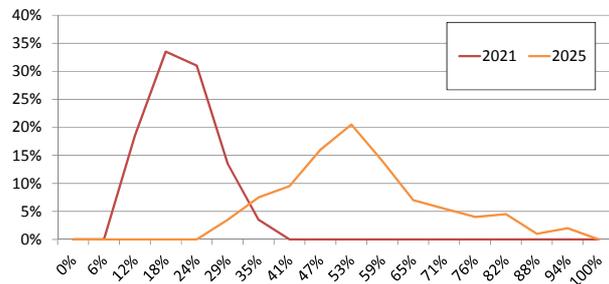
In this context, Synergies developed a sophisticated model to analyse the likely development of the direct trans-Pacific market, in order to assess prospective new investments in that market. The model has the following features:

- a Cournot representation of the behaviour of existing and prospective market participants. This framework was adopted on the basis that the key strategic competitive lever for each participant is the quantity of capacity they choose to offer to the market;
- sophisticated integer linear programming techniques to ascertain Cournot market equilibria in the face of capacity constraints;
- cost penalties associated with parallel high-latency routes to represent the premium that certain types of traffic place on low latency services; and
- Monte Carlo analysis of the impact of uncertainty over a range of critical parameters such as:
  - the timing of new entry
  - the timing of capacity expansion by incumbents; and
  - underlying growth in local demand.

## Some typical results



Estimated future demand



Distribution of revenue outcomes

## Some of our other modelling

- Modelling the optimal mix of contract and self-provision of overburden removal in an open-cut mine in the face of uncertainty over market prices, the extent of the overburden, and plant and equipment failure rates, when there are indivisibilities such as minimum contract duration and equipment purchases.
- Using real options modelling approaches to determine the value of increased flexibility in the supply chain of a major mining operation, and hence the value of securing additional supply chain capacity.
- Using Monte Carlo modelling to assess how the risk of viral contamination of blood products is affected by blood donation regulations, the characteristics of tests for viral contamination, and testing and manufacturing processes.
- Real-options modelling to determine the optimal timing and size of investment in bulk potable water supply in the face of highly variable annual rainfall and various demand rationing measures.
- IO modelling to assess the economic contribution of a major pharmaceutical and R&D company to the Australian economy.
- A combination of game-theoretic and Monte Carlo simulation modelling to forecast the likely pattern of vaccine prices in the face of significant future demand and supply uncertainty.
- Empirical models of the causes and consequences of industrial accidents, including modelling the impact on the rate of accidents of improved workplace health and safety legislation.
- Pricing models for transport supply chains used to determine appropriate end-user tariffs.

## Our people



Sam Lovick, a Principal at Synergies, has developed a large number of practical models in his 25 years of international economic consulting, using a broad spectrum of modelling techniques. His modelling encompasses: electricity markets; real options modelling of water investment, pharmaceutical R&D, supply chain infrastructure; the cost of capital for new investments at airports; game-theoretic models of vaccine markets, pharmaceuticals and broadband transmission; and simulation models of a variety of commercial activities ranging from blood collection to mine overburden removal.



John Mangan is a Principal at Synergies and also Professor of Economics at the University of Queensland. John has a wide area of research interests in economics and is a skilled economic and social modeller, with particular skills in labour market and industrial economics related areas. John has developed a number of economic models of regional areas in Australia, a form of modelling that is ideally suited to assessing the impacts of major projects and industries on their surrounding regions.

Sam Lovick  
+61 437 581 009  
s.lovick@synergies.com.au

Euan Morton  
+61 7 3227 9500  
e.morton@synergies.com.au