

Senate Economics Legislation Committee

Inquiry into the Qantas Sale Amendment Bill 2014

Submission from the systems perspective

Summary

- Qantas has to date omitted to use established modern management control techniques in its business.
- Owing to high system complexity, Qantas effectiveness and efficiency are inevitably far short of what they would be if the techniques were in use. Its costs are necessarily higher and its profitability is lower.
- Qantas has moreover declined to evaluate a comprehensive and detailed application of these techniques for airlines; thereby arguably demonstrating poor management attitudes in this regard.
- Removing limits on foreign ownership, and stipulations that much of the airline facilities and staff be based in Australia, would not solve Qantas' underlying control problems. Only the modern management techniques can do that. There is an evident disconnect between the 'solution' that is officially promoted (the Bill) and the real problems that beset Qantas.
- According to Transport Minister Warren Truss 'The purpose of the bill is to remove the regulatory handcuffs that apply to Qantas but to no other Australian-based airline, including in relation to accessing foreign based capital'. The modern control techniques could be used to discredit or verify this statement. Absent those techniques the statement should be treated as mere unsubstantiated assertion.
- The Federal Government and Qantas should both shelve their present intentions until the Airline has attained modern effectiveness and efficiency. At that stage the situation could be re-evaluated, in a rigorous scientific manner.

Approach of this paper

The Qantas Sale Amendment Bill 2014 is regarded as an ideologically-driven distraction that

- has little to do with the real reasons for Qantas' present situation;
- would not lead to resolution of the Airline's problems;
- would involve additional loss of time before a real solution is implemented and, perhaps, significant loss to the Australian economy.

According to the ABC's website 'the airline itself says changing its ownership restrictions won't address the immediate and urgent matters at hand'.

Instead, as a highly-complex managed system (the real underlying cause of its woes) Qantas should be encouraged to adopt modern best practice, in the form of established techniques for decision support and management control. That path

could transform Qantas' effectiveness and efficiency, which would also benefit the Australian economy. Enhanced effectiveness and efficiency would translate fairly directly into improved competitiveness

These techniques are apparently little used in Australia. That reflects on the 'ethos' here, not on the techniques. Another reason for lack of use here is that the many corporate users around the world, for good reasons, virtually never publicise their use of the techniques. Most Australian potential users have never heard of the techniques.

This paper accordingly introduces the techniques and discusses how Qantas could use and benefit from them. The Senate Committee would be justified in reporting that the Qantas Sale Amendment Bill 2014 is not the way forward, but that a path leading to enhanced Qantas effectiveness and efficiency, is.

Use of the appropriate modern techniques would also be needed to determine authoritatively effects of any proposed (regulatory) initiatives on Australian aviation, and on the broader economy.

System complexity

Qantas is a highly-complex managed system. Complexity refers to things such as

- Large numbers of variables, each of which is linked to all other variables directly and/or indirectly by interacting feedback loops. Variables on those loops are impacted by many parameters or constants.
- Nonlinearities. Each of these can cause that part of the system which is currently dominating behaviour and outcomes to change unpredictably.
- Randomness, which can be represented by probability distributions.
- Output and performance effects that are distributed over two or more time periods.
- Impacts from external events and forces etc.

Complexity greatly exceeds levels at which human managers can operate optimally (effectively and efficiently in terms of modern standards). Qantas as a 'system' in management-science terms is literally invisible to its managers, as long as they operate in manual terms.

The modern solution to system complexity

During WW2 the US military and industry became concerned about their limited capacity to handle control problems of that period. In the late 1940s those interests approached the Sloan School of Management at the MIT to request development of new techniques for control of complex managed systems. Development was funded in part by the Ford Foundation. The techniques, known as system dynamics (SD), became publicly available in 1957.

Now, over fifty years later, many (perhaps most) large companies and corporations around the world have SD models of themselves. These are used for

- activity and resource control (physical and financial);
- tactical and strategic planning;
- budgeting;
- coordination and rationalisation etc;
- commercial-industrial intelligence;
- major civil litigation;
- international corporate tax avoidance.

XYZ Corporation's model looks exactly like the actual XYZ. It is a 'virtual XYZ'. The model can behave in the same detailed manner as XYZ will or may (subject to assumptions) in future time.

This model provides the following capacities to XYZ and other enterprises:

- real prediction and replication (prediction of system values for past periods);
- controlled, low-risk 'what if' experimentation;
- causal analysis of reasons for actual and simulated outcomes.

Real prediction is estimation of (future) system variable values in terms of the same factors that generate those system values in reality.

The above capacities are modern best practice. No other approach, including manual, can approximate their decision-support benefits and services, or the resulting system effectiveness and efficiency. This, of course, translates into big positive impacts upon costs and profitability in companies.

Who uses corporate models?

With apparently only one exception none of the many corporate models developed since the late 1950s has been publicised. Reasons for lack of publicity are easily understood. A company's corporate model is among its most secret possessions, especially in regard to the model's input and output data (numbers), and to some of the uses listed above.

The sole exception whose corporate model was publicised is a large US shipbuilder known as Ingalls, now part of Huntington-Ingalls. H-I, based in Newport News VA, is currently (early 2014) building two of the next generation of nuclear-powered super carriers: the Gerald R Ford and the John F Kennedy.

The Ingalls model was publicised (*Naval shipbuilding – a claim settled and a framework built*, Interfaces, Kenneth G Cooper, 1980) because it made legal history as the first occasion on which a simulation model provided the main basis of proof in major civil litigation.

In the 1970s Ingalls (then owned by Litton Industries) contracted with US Navy for two large shipbuilding projects. During the next six years Navy bankrupted the shipbuilder to the extent of \$US500 million in mid-1970s prices, by delays, disruptions, and changes of mind etc. Litton intended to close down Ingalls.

The problem was: how to prove Navy responsibility? Ingalls' management knew that traditional approaches to litigating such complaints had proved vulnerable in court.

Instead Ingalls commissioned the development of a SD model of its total engineering operations. These included the two Navy projects and all other work in hand during the period.

For litigation purposes the model was run twice. The first run, the control, recreated the events and outcomes of the six years. This was prediction in past time, or *replication*. The second run repeated the first, except that Navy actions and omissions subject to complaint were excluded. The courtroom basis of proof comprised a detailed comparison of output from the two runs. That is a frequent way of using a SD model as a decision-support tool.

Navy agreed that the first run accurately reproduced the events and outcomes of the six years. Evidently Navy also accepted the results of the second run, and the comparison between the runs. There was an out-of-court settlement for \$US447 million in mid-1970s prices, in favour of Ingalls. The model was responsible for the majority of this outcome. This underlined the great predictive and analytical power of SD corporate models.

The shipbuilder survived and applied its model to future management decision support. Litton also adopted the causal modeling techniques for its own management control etc. The techniques have been employed in subsequent cases of major civil litigation.

Some other large companies and corporations known to be using SD corporate models include Cummins Diesel, GE, GM, Northrop-Grumman (Ingalls' current parent company), McDonnell-Douglas, Fluor Corporation, Raytheon, Mastercard, Ford, IBM.

Significantly, airlines around the world (including Qantas) apparently do not currently use SD corporate models. However, an airline has been modeled in SD, comprehensively and in detail. If and when provided with Qantas input data (numbers) this software would become a 'virtual Qantas' in the senses described above. That capacity would have significant advantages for the Company; including abatement of operating risk.

Implications for recent Qantas developments

Qantas was offered the airline software in early 2013, but declined to evaluate it or to give reasons for that refusal. Now, more than a year later, Qantas could be benefiting from the software's formidable technical capacities. Its commercial and financial situations would arguably be much more favourable than is actually the

case. This reflects the gulf between current best practice, on the one hand, and the manual management practices of Qantas, on the other hand.

The Airline is entitled to exercise its business judgment and to make its corporate decisions. In the present case, however, if it turns its back on modern best practice, it is not entitled to extend the corporate begging bowl to Government.

The preferable outcome is for Qantas to shelve its present aspirations and intentions, in favour of first adopting modern best practice. The situation could then be re-evaluated.

The writer

I have a Master's degree in managerial economics from the ANU. My Ph.D (also from the ANU) is in the management-science causal modeling techniques referred to above. I am a fellow of the Institute of Chartered Accountants in England and Wales.

I have over thirty years' professional experience in large-scale modeling of private- and public-sector managed systems for decision-support and management control purposes. I have modeled a series of managed system types. Airline is one of these types.

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