Answers

1 To: The board of Boltzman
From: A Accountant
Date: December 2014
Subject: A coherent approach to performance management at Boltzman

This report brings the different initiatives together using the performance prism framework. The suggested performance measures are evaluated and then used in a benchmarking exercise of Boltzman compared to General Machines. Finally, the quality improvement initiative is commented upon.

(i) Performance prism

The performance prism has five facets which attempt to unify various methods of performance management into a coherent whole. The facets are stakeholder satisfaction which then depends upon the other four facets of stakeholder contribution, strategies, processes and capabilities. The failure to listen to shareholder concerns may lead to performance measurement which is driven by internally-derived strategies. By taking the wider view offered by the prism and by focusing on stakeholders, the model might help to avoid this problem.

The analysis of stakeholder power will assist in answering questions associated with two facets: those of stakeholder satisfaction (what do they desire?) and it may also provide ideas on how the stakeholders can contribute to the success of Boltzman. For example, the relatively weak position of suppliers may lead Boltzman to be able to push them to make improvements to the quality of their components while maintaining the same selling prices.

The benchmarking exercise will help in setting strategies with which the business aims to achieve stakeholder satisfaction. It may identify strategies for improvement although here the data used will only give a strategic view as it is not operationally detailed and so is unlikely to supply much information on processes. It may be a starting point on capabilities as it does supply some information on employee pay and so indirectly their satisfaction and motivation.

The quality initiative will impact on processes and capabilities. There will be a need to redesign processes in order to meet stricter quality standards. There will be a need to increase the capabilities of the organisation to manufacture with lower fault rates and at finer tolerances and this may come through greater emphasis on staff training to improve their capabilities or alternatively, through investment in the automation of processes to improve speed and accuracy of production.

(ii) Stakeholder analysis

The matrix suggests different management approaches are appropriate for each group of stakeholders, depending on their likelihood of engagement in decision-making and their ability to influence that decision-making.

Shareholders have considerable power but do not wish active involvement in decision-making (this is what they pay the management to handle). Therefore, they must be kept satisfied by ensuring their financial targets are met.

Employees have little power generally and so need to be kept informed. However, there is a sub-group of key employees with skills who the company must retain and this sub-group should be kept satisfied by the provision of opportunity to develop their skills through training and work on new technologies.

Customers are key players given the importance of our components to their business and the lost revenue if one were to drop us as a supplier. Therefore, they should be managed closely by having staff dedicated to liaising with them and involving them in product development. This type of close cooperation is likely to be necessary in high-technology industries such as ours.

Suppliers have little power and Boltzman should be in a position of strength in negotiation over the price and quality of their goods. They should require minimal effort and they would be expected to be doing the work to meet our needs as a major customer. However, suppliers are a common source of innovation, so keeping them informed of developments would be sensible. In particular, good supplier relations will be important for a move to JIT manufacturing.

Evaluation of suggested performance indicators

Performance measures should be focused on the influential stakeholders identified above.

It is appropriate that most of the indicators are directed towards the key players identified above. Return on capital employed, economic value added, revenue growth and net profit margin are all suitable measures for the shareholders as these measure financial returns across the organisation – its efficiency in deploying capital, its ability to grow sales and its efficiency in turning sales into returns for shareholders.

There are no indicators directed at customers who are key players. This is a major omission in the list of indicators suggested. It would be helpful to have indicators covering the price/quality mix of Boltzman's products and their innovative nature in such high-technology industry sectors. Also, there are no external measures of competitive advantage given in the list of indicators.

Average pay per employee is a poor indicator as this does not focus on the sub-group of key employees. It is appropriate to have an indicator for this group and it would be *their* average pay (possibly as a percentage of an industry benchmark) which would be valuable.

Suppliers do not have significant power or importance to Boltzman, being easily interchangeable. Therefore, it is appropriate that there is no indicator directed at them, although this will have to change as JIT is introduced.

(iii) Benchmarking against General Machines

Benchmarking method

The benchmarking exercise is an external one where comparison is drawn with a major competitor. This is valuable in identifying areas of the competitor's competitive advantage and also areas for improvement with a similar business. However, although this method can suggest areas where Boltzman can catch up with its major competitor, it will not identify how to gain advantage over General Machines.

Another fault in this method of benchmarking is that it will only indicate strategic improvements not operational ones, as such detailed information is unlikely to be in the public domain. It may be sensible to consider functional benchmarking with a world-class company from another business sector. Boltzman could share detailed operational data without the worry of loss of confidential information directly to a competitor. This is commonly done where quality initiatives, such as at Boltzman, are being introduced. Boltzman may find that its customers are already collecting process quality data and would be willing to share with a top tier supplier.

Benchmarking results

	Boltzman	General Machines
Return on capital employed	15·5%	9·2%
Economic value added ($m)		
Operating profit	2,907	1,882
less tax charge	(663)	(718)
less tax benefit of interest	(81)	(88)
NOPAT	2,163	1,076
WACC	11%	11%
Capital employed	18,785	20,373
Economic value added (= NOPAT – rC)	97	(1,165)
Revenue growth	6.4%	1.0%
Average pay per employee ($ p.a.)	54,618	52,299
Net profit margin	8·2%	3·3%
Other indicators:		
Product development cost/Revenue	11·2%	10·2%
Top tier supplier status (out of possible 20)	13	14

[**Tutor note:** *ROCE figures are based on year opening figures although year closing figures are acceptable. Credit was also given if adjustment of EVA for product development costs was considered.*]

Two new indicators have been suggested based on the previous analysis of stakeholders. It was identified that there was a major omission of measures associated with customers and so the level of product development spending and the company's status as a main supplier to large customers are considered. The product development indicator will demonstrate the potential for innovation in products and possible growth of the business. The supplier status gives a measure of the customers' perception of quality of the business's products.

The results suggest that Boltzman is doing better than General Machines financially (ROCE, economic value added and profit margin) and has better current and possibly future growth prospects (revenue growth being driven by higher product development spending). The one area of weakness identified relates to size where General Machines has a higher revenue and more top customer accounts but with the higher growth of Boltzman, this may not last long.

(iv) JIT initiative

The JIT initiative will bring great benefits to Boltzman but will also place new demands on management in the business. It will fit well with the move to lean manufacturing.

The difficulties involved in introducing just-in-time manufacturing begin with the need to forecast demand accurately in order to time manufacture as required. This requires close links to our customers which should be possible given our status as a top tier supplier.

If we are only producing to order, then we can suffer if our own suppliers fail to make deliveries of sufficient quality and on time. The suppliers used at present are bulk suppliers and may not be used to the level of quality and ability to deliver on time which JIT requires. We will need to perform a detailed review of our supply chain in order to identify those suppliers who can meet our needs now, or else be brought up to that standard. We may then partner with a few suppliers in order to help them to improve their standards of service and quality of components.

By restricting the number of suppliers, we will be more open to disruption of our supply chain. We may wish to keep our suppliers local to the manufacturing sites but, of course, this restricts further our choice of supplier and so increases their bargaining power with us.

A further challenge will be the change in mind set which will come from moving to JIT where the focus of effort is no longer just on cost reduction but also on appreciation of the value of non-financial factors associated with quality. This change will have to occur throughout the organisation and is often most difficult at the operational level, where, for example, the basic layout of the factory must be redesigned and the workforce need to be flexible on working patterns and multi-skilled to avoid bottlenecks.

2 **(a)** Public sector organisations have a number of problems which can be at least partially addressed with the use of non-financial performance indicators.

– **Lack of profit measure**

BLA's waste management is not expected to make a profit. This is obvious from the fact that there is no specific charge for the service and so no clear revenue stream associated with it. The danger is that the only financial measure is cost and, in the current state of Seeland, this would mean that positive progress would only be seen in its reduction. This would be to the detriment of service and the three goals for the department (safe, clean, environmentally friendly).

– **Multiple objectives**

It is difficult to say which is the single, overriding objective unlike in a profit-making organisation. This requires an approach which takes account of all the perspectives. BLA shows this in its three goals, none of which are financial.

– **Difficulty in defining a suitable financial measure**

Many non-profit seeking organisations provide services for which it is difficult to define a cost unit. At BLA, should the cost unit be cost per tonne of waste collected or cost per household or cost per tonne of waste landfilled? Also, the benefits of the service are mainly non-financial such as clean streets.

The three goals of BLA's waste management department could be addressed by looking at health statistics, tourist/resident surveys and tonnage of recycled waste. These are all non-financial in nature.

(b) The standard criteria for analysis of the value-for-money of a service are:

– Economy – the optimisation of the resources which the organisation has; ensuring the appropriate quality of input resources are obtained at the lowest cost;

– Efficiency – the optimisation of the process by which inputs are turned into outputs;

– Effectiveness – how the outputs of the organisation meet its goals.

At BLA:

Economy could be measured by looking at the cost of buying equipment such as the lorries or fuel or the major cost of staff (44% of the total). The current average staff pay is $31,429. This is above the national average pay of $29,825. However, paying more for each member of staff could result in greater efficiency as staff members have improved skills.

Efficiency could be measured by the number of tonnes of waste moved per staff member (629 tonnes/staff member) or the cost of collection of waste per tonne ($114) or the staff cost per tonne collected ($50). Benchmarking these against national averages, the cost of collection of waste per tonne and staff cost per tonne collected are below the national averages of $123 and $51 respectively while the tonnes of waste moved per staff member (583 tonnes/staff member) is higher than the national average. This implies that BLA is showing good efficiency in its use of resources. The balance of capital and staff costs would also indicate how labour intensive the department's work was, for example, the value of the lorry fleet per tonne collected compared to the staff cost per tonne collected. No figures are given for lorry fleet value, so no quantification of this can be done.

Effectiveness has to be measured against the departmental goals:

1. Public health concerns – this is a vague objective and could be measured against many indicators such as level of vermin or levels of diseases related to waste. The lower frequency of collections (17% below national average) may present a public health problem.
2. Clean and attractive streets – this is a subjective goal as discussed above. The level of tourism and return visits may give a rough measure of this goal. The trend in complaints by residents will be a more reliable measure.
3. Increased recycling – the trend in tonnes recycled would be one measure but an imprecise one. If waste collected is generally going up, then this will rise too. A better measure of the effort to increase use of recycling would be the percentage of waste which is recycled compared to the government's target. (BLA is recycling 43% of its waste which is already ahead of the target of 40% by 2015. It is also ahead of the national average of 41%.)

(c) The major problem in interpreting qualitative data is that it is subjective since it is based on people's opinions. For example, in assessing quality of service people have different expectations and priorities and so are unlikely to be consistent in their judgements. At BLA, customer complaints will be driven by such opinions. Some customers may wish to see effort focused on recycling, while others may be more concerned about unsightly waste in the streets and others will focus on the frequency of waste collections. Some customers may not understand that improved waste collection is only possible with spending implications which may not be acceptable due to the current recession in Seeland.

One way to reduce the effect of subjectivity is to look at trends in performance since the biases in opinion will be present in each individual time period but the trend will show relative changes in quality.

The recording and processing of qualitative data can be difficult. Opinions are expressed in language and it can be difficult to tell if a complaint which describes service as 'awful' is more or less serious than one which describes service as 'unacceptable'. The current data for BLA does not contain any such information and this is often the result of these difficulties in collection.

The most common way to try to overcome this problem is to turn the data into quantitative data. For example, surveys often use scoring systems to capture data on service. A scoring system will often ask the customer to rank their satisfaction at the service provided on a scale of 1 to 5 with '1' representing 'completely satisfied' and '5' representing 'totally dissatisfied'.

However, the problem remains that such scoring systems are still subjective, and it has often been found that there is a tendency to score toward the middle as people tend to feel uncomfortable using the extreme scores of 5 or 1.

BLA waste management will suffer from these problems particularly in their goal of keeping the streets attractive as this will clearly require subjective judgement in its assessment.

3 (a) The environmental goal of Maxwell is to reach the CO_2 emission reduction target of 20% in five years while increasing capacity to cope with an expected rise of 10% in demand over that period.

The changes in mix of generating stations have the following effects:

Plan 1a

		Details for each type of station			Totals for Maxwell		
Power station type		**Maximum generating power (MW)**	**Operating cost of electricity ($/MWh)**	**Capital cost ($m)**	**Number of stations**	**Total capital invested ($m)**	**Total CO_2 emissions (million tonnes)**
Coal	(small)	300	25	1,320	3	3,960	2·36
	(large)	600	25	2,640	3	7,920	9·46
Gas	(small)	300	50	300	7	2,100	2·76
	(large)	900	50	900	2	1,800	7·10
Nuclear		1,200	20	6,000	3	18,000	0·75
						33,780	22·43

The new nuclear station will cost $6,000m. The total power output of Maxwell is maintained at 10,200 MW and the total CO_2 emissions falls by 15·4% to 22·43 million tonnes. The operating cost of electricity will fall on average as a nuclear station is the cheapest one to operate. Therefore, Maxwell will have maintained its capacity and reduced CO_2 emissions but it will not have covered the rise in demand nor met the government's target for CO_2 reduction. (Plan 1b will provide the same generating capacity as Plan 1a and it will be less expensive in capital terms but it will not reduce CO_2 emissions.)

Plan 2

The addition of a second new nuclear station would cost a further $6,000m and would increase power-generating capacity by 11·8% to 11,400 MW. This would cover the expected rise of 10% in demand for electricity due in the next five years. It would increase the total CO_2 emissions by only 1·1% (0·25/22·43, assuming it is done in combination with Plan 1a) and would, therefore, further reduce the average CO_2 emitted in the operation of the stations.

We do not have the detailed figures for actual power output for each station but if we use maximum power capacity, then currently, Maxwell produces 0·0026 tonnes of CO_2 per max MW (= 26·51/10,200).

If the company pursues plan 1a and plan 2 in combination, then it will produce 0·0020 tonnes of CO_2 per max MW (= 22·68/11,400). This is a 23% reduction and indicates the government's target may be achieved.

If the company pursues plan 1b and plan 2 in combination, then it will produce 0·0023 tonnes of CO_2 per max MW (= 26·76/11,400). This is a 12% reduction and indicates the government's target may not be achieved.

[**Tutor note:** *The calculations shown in the table here are more detailed than is required for a good answer.*]

(b) Lifecycle costing records the costs of a product 'from cradle to grave', taking into account the environmental consequences across the whole life of the product. In order to appraise a project correctly, cost recording systems must capture all costs.

In particular for a nuclear power station, these must include:

– those costs incurred prior to production such as costs of handling regulatory difficulties and design choices, and also

– those costs incurred after production ceases such as the clean-up costs of decommissioning and decontaminating the site and safely storing all waste.

It is important that these costs are identified and included in the initial project appraisal. In the case of Maxwell building a new nuclear power station, there are the uncertain costs up front associated with the regulatory process which could include the financing costs associated with delays in the project while regulatory approval is sought. There is the normal uncertainty

over the building cost when a project costs $6bn and takes five years to complete. Finally, there is the estimated $1bn in decommissioning costs which again carry uncertainty. If Maxwell is to be able to claim to be financially and environmentally responsible, then it must have plans in place to cover these costs.

(c) Input/output analysis records material inflows and outflows rather than financial inflows and outflows. It operates on the basis that what comes in must go out, or be stored. It ensures that the business will consider how it uses its resources and focuses it on environmental cost.

At Maxwell, it will be the flows of fuel in and then the emissions of waste along with electricity out which will be measured. Maxwell already collects data on CO_2 emissions but power stations are known to produce other pollutants and data on these could be collected too, in order to be prepared for when the government turns its attention to these emissions.

The difficulty with adopting this technique is putting monetary values on the outputs. However, at Maxwell, it will be possible for the business to use the proposed carbon tax to value CO_2 emissions and thus focus on environmental costs, and the levels of waste being generated by its processes.

The impact on information systems is the need to collect non-financial data about volumes of emissions which will require measuring equipment to be fitted to the power stations and then data collected. The data will have to be input into the management information system. The type of system could provide real-time data which would be wirelessly uploaded into the company network. This would allow monitoring of the variation of emissions with the load factor on the station and so permit analysis of the conditions under which the stations are most pollutive, so that corrective action can be taken. The existence of a CO_2 monitoring system should mean that the infrastructure for collection of other pollution data is more readily available.

4 (a) The results from both models indicate that Culam is not likely to become insolvent in the next two years. However, there are good reasons to question the applicability of these models to Culam's business and so it would be dangerous to place too much reliance on these results.

A quantitative model such as those presented here identifies financial ratios which significantly differ in value between surviving and failing companies. Statistical analysis is then used to choose the weightings for these ratios in a formula for a score which can be used to identify companies which exhibit the features of previously failing companies. Obviously, the company being analysed must be similar to those being used to build the model for the results to be relevant.

The Altman Z-score was originally developed in the late 1960s and was based on data from US companies, primarily in the manufacturing sector. Therefore, there are three reasons to question the applicability of such data to Culam.

1. The world economy has changed significantly since Altman's original work. The data for this model is now nearly 50 years old.
2. The economy of the USA may not reflect the market in which Culam works.
3. The mining sector is not like general manufacturing, for example, it is highly capital intensive with long periods of no revenue generation.

The Q-score model was based on recent data from Teeland businesses. As for the Z-score, Culam is not likely to be appropriately modelled by such data. The problems are:

1. The Q-score is based on data for Teeland listed companies and Culam is a mining company with an unusual pattern of revenue and costs supplying a global market. It is therefore unlikely to be similar to the companies on the small Teeland exchange, both in its markets and its business model.
2. If Teeland's exchange is small, there may not be much data from failing companies on which to base the model.

Neither of the models addresses factors which may have a large impact on Culam's survival such as world commodity prices and foreign exchange rates.

(b) The lifecycle issues for Culam relate to the long timescale (23 years) for development and use of a mine and the uneven cashflows over this lifecycle.

The initial development phase of two years will require large capital investments with no revenue being generated. There is then a 20-year revenue-generating phase followed by a final year of decommissioning costs with no revenue.

This will impact on the Z-score by making the score very volatile as the mines go through the three phases of their lives.

- During the development phase, total assets are growing while revenue is zero. This will mean that the X5 variable will be zero and the X1 and X3 variables will be falling, thus lowering the score.
- During the working phase of the mine, the total assets will be static or falling (depending on the accounting for reserves) while the revenue is high.
- Finally, during the decommissioning phase, the assets will be falling and again there will be no revenue, so a low Z-score could be expected.

The fact that Culam has only four mines will mean that the phase of any one mine will have a significant impact on the score. If two mines are in development at the same time, then there is likely to be a large effect in lowering the Z-score. It will be the scale of the financial resources which Culam can call on over the life of the mines which will dictate its survival.

(c) The type of action which Culam's board can take to reduce the risk of collapse of the business is to grow the business by buying or developing many more mines, so that the failure of any one project does not bring down the business. Staggering the development of the mines would also help to address this issue.

The board could also seek to alter the proportion of revenues generated from long-term contracts rather than the more volatile spot market. By signing over more of the production to contracts of fixed revenues, the business's cashflows will be more reliable.

The board could learn from the mistakes of their competitors by avoiding over-priced acquisitions or other large project failures by performing suitable due diligence and risk analysis in advance of the investment.

The board could be proactive in managing other major risks by using hedging techniques in order to reduce volatile revenues due to:

– foreign exchange rate changes when the costs of the mines will all be denominated in local currency; and
– commodity prices on the spot market.

Although the use of such techniques will be limited by the availability of long-term hedging contracts.

[**Tutor note:** *This solution may look short (of ink) but it is an illustration of how a good compact answer can look. More work in description and justification would have to be done to gain credit for more obvious advice such as 'increase revenue' or 'reduce costs'.*]

1 **(i)** 3 marks for the general description of the prism facets
1 mark for the aim of the prism
Up to 3 marks for the discussion of each initiative and how it fits within the prism

Maximum 9 marks

(ii) Up to 2 marks for analysis of each of the four stakeholders
Up to 10 marks for evaluation of the five indicators suggested

Maximum 14 marks

(iii) Up to 6 marks for evaluating the method of benchmarking

Calculations:
1 mark for each indicator calculated (up to 6 marks) except economic value added
3 marks for calculation of economic value added
1 mark for the justification of each of the two new indicators suggested

Up to 3 marks for a reasonable conclusion

Maximum 16 marks

(iv) 1 mark for identifying each difficulty of implementing JIT
– additional marks where this is developed for Boltzman's situation.

Maximum 7 marks

Professional presentation: up to 4 marks

Total 50 marks

2 **(a)** Up to 4 marks for general discussion
Up to 4 marks for examples relevant to BLA

Maximum 6 marks

(b) Up to 3 marks for a description of a general approach to VFM
1 mark per point – discussing each heading at BLA

Maximum 12 marks

(c) 1 mark per point made

Maximum 7 marks

Total 25 marks

3 **(a)** 2 marks for identifying the detailed environmental goal
1 mark for choosing suitable ways to assess the goal (choice of indicators)
Up to 4 marks for each plan

Maximum 10 marks

(b) Up to 2 marks for describing lifecycle costing
Up to 6 marks for discussing issues associated with Plan 2

Maximum 6 marks

(c) Up to 6 marks on input/output analysis
2 marks for general discussion
4 marks for application to performance measurement at Maxwell

Up to 5 marks on the impact on information systems

Maximum 9 marks

Total 25 marks

4 **(a)** 1 mark for general interpretation of calculation
4 marks for general description of how a quantitative model works
Up to 9 for problems with the models

Maximum 10 marks

(b) 2 marks for general issues
1 mark for description of lifecycle
6 marks for impact of lifecycle on Z-score

Maximum 7 marks

(c) Up to 2 marks on each improvement – 1 mark for the description of an improvement and 1 mark for the justification

For example:
Increase size of business – portfolio effect
Use of fixed price contracts to avoid volatile commodity prices
Use of FX hedging to avoid revenue volatility
Learn from the mistakes of others – avoid big project failures

Maximum 8 marks

Total 25 marks