A DYNAMIC BALANCED SCORECARD TEMPLATE FOR PUBLIC SECTOR AGENCIES

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ABSTRACT :

Performance indicators are key feedback drivers of organisation dynamics. However, the evaluation literature gives no scientific basis for their selection or validation. An even more significant omission in the literature is the validation of "business rules" associated with such indicators. It is presumed that managers instinctively know the "right way" to respond to indicator change. Research shows that managers typically misread delayed feedback effects and their decisions are correspondingly inappropriate. The balanced scorecard suffers from the above limitations, especially the feedback interrelationships between indicators.

This paper discusses development of a "dynamic balanced scorecard" based on the *system dynamics* paradigm,which accounts for delayed feedback effects. The paper outlines the modelling of causal interactions within an organisation that impact on output quality.

Keywords: system dynamics; balanced scorecard; BSC; performance indicators ; KPI

THE FUNADAMENTAL VALUE ADDED OF THE BALANCED SCORECARD

The Balanced Scorecard is an outcomes oriented performance management system that seeks to link the activities of an organisation to its vision, mission, and strategy through the establishment measurable goals and linked cause-and-effect performance indicators.

The Balanced Scorecard is more than performance measurement system. It is a management system that focuses the efforts of staff towards achieving strategic objectives. It seeks to give feedback on current performance so that managers will adapt priorities towards value improvement and make decisions that give effect to this. It seeks to give feedback on the key drivers of longer term future performance, so that when the future arrives it has been long anticipated in managerial priorities and decision making.

The 1997 Management Advisory Board (MAB) report 'Beyond Bean Counting' recommended the Balanced Scorecard as

> *" ... a valuable tool for organisations in both the public and the private sectors that wish to drive a process of strategic change ... It also harnesses the strategic vision of the organisation in a holistic view of the key drivers of success, and closely integrates the strategic vision with the operational planning and budgeting activities of the organisation."*[1]

A "good" BSC is not simply a limited list of measures gathered into four categories, but communicates and promotes adherence to the strategy to all levels of the organisation.

> *"(The BSC) ... tells everyone in your organization, in a single page, the story of your entire strategy: Every measure is part of a chain of cause-and-effect linkages. All*

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[1] Commonwealth of Australia, Management Advisory Board, "Beyond Bean Counting - Effective Financial Management in the APS - 1998 & Beyond". PSMPC, Dec 1997. p.54.

measures eventually link to organizational outcomes. A balance exists between outcome measures (financial and customer) and performance drivers (value proposition, internal processes, learning & growth)".[2]

Cause-and-effect according to Kaplan and Norton

Kaplan and Norton emphasise that the chain of cause-and-effect should pervade all four perspectives of the BSC and should include key performance drivers that impact on strategy.

> *"Our experience is that the best Balanced Scorecards are much more than collections of critical indicators or key success factors organized into several different perspectives. The multiple measures on a properly constructed Balanced Scorecard should consist of a linked series of objectives and measures that are both consistent and mutually reinforcing.* ***The metaphor should be a flight simulator, not a dashboard of instrument dials.*** *Like a flight simulator, the scorecard should incorporate the complex set of cause-and-effect relationships among critical variables, including leads, lags, and feedback loops that describe the trajectory, the flight plan, of the strategy."* [3] (Emphasis added)

By having an explicit set of linkages among Balanced Scorecard measures, managers can test the organisation's hypothesised causal chain of performance drivers and outcomes and can learn how different business rules impact on organisation performance. Whilst acknowledging that many hypothesised linkages will be qualitative, Kaplan and Norton suggest that the end point would be *"... the Balanced Scorecard ... captured in a system dynamics model that provides a comprehensive, quantified model of a business's value creation process."* [4] They clarify what they mean by this, referring to the system dynamics paradigm developed by Jay Forrester at MIT, quoting various system dynamics references.

> *"In effect, the causal and dynamic relationships in a Balanced Scorecard can be modelled with a system dynamics approach."* [5]

In his recent paper, *"Is Management Finally Ready For the Systems Approach?",* David Norton argues forcefully that the system dynamics approach provides the perfect framework and an underlying science to underpin the BSC:

> *"Sophisticated tools such as dynamic simulation exist to support this framework. It's time to bring back the systems approach.*
>
> *Balanced Scorecards, and the strategy maps on which they are based, reflect the philosophy of the systems approach. The view of strategy as a linked set of actions and outcomes which take place over time describe the system. The double-loop management process on which the Strategy-Focused Organization is based is derived from the principles of cybernetics (feedback and control), which are fundamental to systems ... The systems approach is the perfect discipline to describe and evaluate business strategy ... Systems engineering should be a required course in every business school and executive program. It is the management framework that meets the needs of the times."* [6]

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2 Kaplan RS, "The Balanced Scorecard", July 13, 1999. http://www.mastersforum.com/kaplan/kaplan.txt

3 Kaplan, RS and Norton DP, "Linking the Balanced Scorecard to Strategy", *California Management Review*, Vol. 39, No. 1, Fall 1996. p.64.

4 Ibid., p. 67.

5 Ibid., p. 79.

6 Norton DP, "Is Management Finally Ready For the Systems Approach?" Balanced Scorecard Report, vol. 2, no. 5., Jul 2001. Harvard Business School.

Cause-and effect in the general Balanced Scorecard literature

A review of several hundred US public sector reports on the BSC revealed a total lack of substance regarding cause-and-effect indicators. A recent 'search' of the World Wide Web recorded over 100,000 'hits' relating to 'balanced scorecard'. Subsequent refinement of the search to find those papers with a systemic understanding of causality is illustrated in Table 1.

Table 1: Number of 'balanced scorecard' hits relating to systems thinking from a total of 105,000 Web references

	Including **System Dynamics University Courses, Software Vendors & Consultants**	***Excluding*** **System Dynamics University Courses, Software Vendors and Consultants**
Causal Loops / Cause & Effect	37	3
System Dynamics	30	3

Cause-and-effect in the BSC in practice - fundamentally flawed

Even more disturbing is the fact that virtually every reference to cause-and-effect in the BSC literature is fundamentally flawed. The cause-and-effect chain is invariably presented as *uni-directional causality* which totally ignores feedback, and especially *delayed feedback.* Even the copious writings of Kaplan and Norton typically represent cause-and-effect as a unidirectional impact, as illustrated in Figure 1.

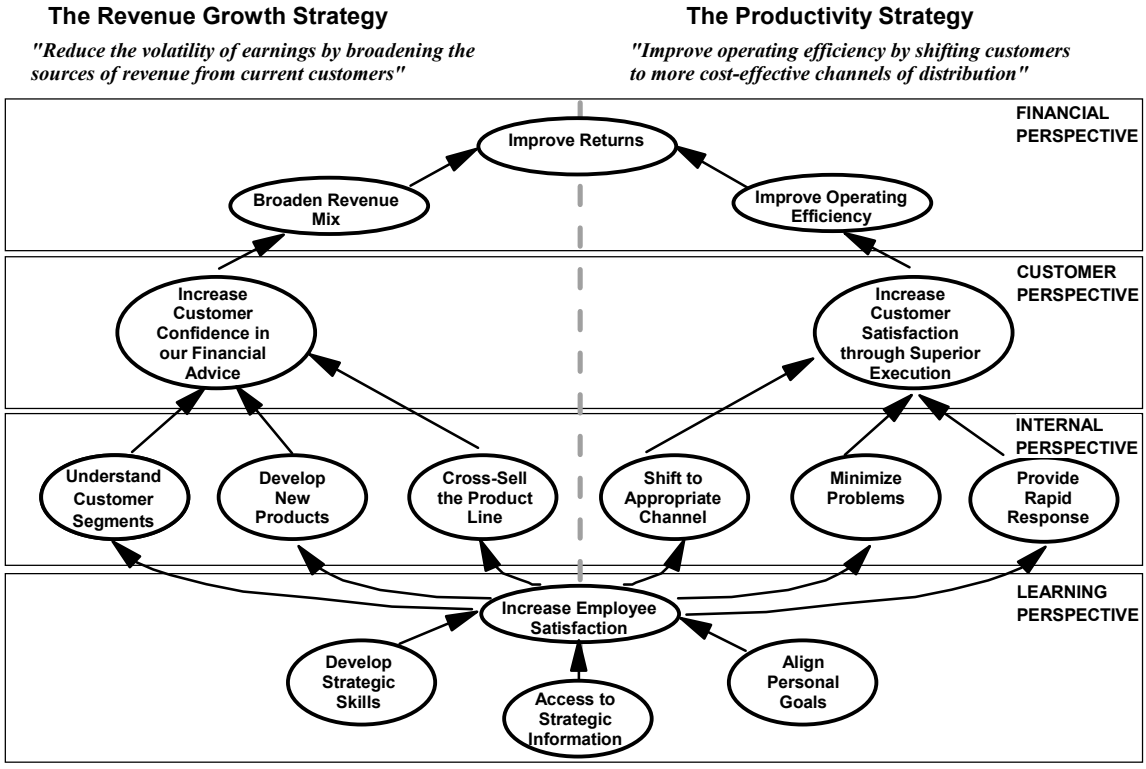

Figure 1: Example from Kaplan & Norton - Unidirectional Cause & Effect Chain Supporting Strategy (Kaplan and Norton, 1996)

Figure 1 assumes that 'Employee Satisfaction' will not be affected by changes in work processes (internal perspective), changes which might involve staff reductions, reskilling, higher intensity work, etc. It assumes that there is no feedback from success in the customer

sector to 'Employee Satisfaction'. Arguably, the (totally ignored) feedbacks from the 'Internal' and 'Customer' perspectives would have greater impact on employee satisfaction than the rather rarefied 'causes' suggested in the Learning perspective. Also , Figure 1 ignores the obvious feedback link from financial returns which provides the capacity to invest in learning and growth or reengineering of internal processes.

CHOOSING INDICATORS AND VALIDATING BUSINESS RULES

A fundamental purpose of performance indicators is to give decision makers feedback on program operations in order to guide future decisions. In order to be confident regarding decisions made consequent on such feedback, however, two key conditions must be satisfied:

- there should be a rigorous, verifiable, basis for selecting indicators; and
- there should be a rigorous, verifiable, basis for developing the business rules appropriate to 'off-trend' movements in these indicators.

We have reviewed (albeit cursorily), some 900 documents referring to performance indicators, performance management or the BSC that are contained in the Commonwealth Managers' Toolbox and the Defence Managers' Toolbox[7] or on the web sites for the Australian National Audit Office and the Federal Department of Finance and Administration. These ranged from one page circulars to multi-hundred page reports and covered the period 1989 to 2001. This literature has little beyond platitudes for choosing and validating performance indicators. The wider literature on performance management is similarly unhelpful. The contributors to successive Australasian Evaluation Society conferences have also skirted this issue.

The issue of validating business rules for responding to off-trend indicators also seems to be totally ignored in the literature. Let me illustrate the significance of the issue.

The original VW 'Beetle', with its engine in the rear, was very susceptible to going into a 'rear-wheel skid' when cornering. Picture the scene: Our 'digital dashboard' KPI system flashes "Rear-Wheel Skid". The manager (driver) has 3 decision levers: the break, the accelerator and the steering wheel. The instinctive managerial response is to steer out of the skid and / or hit the break. The technical reality is that either of these 'business rules' will accentuate the skid; whilst application of both could cause the car to roll. The correct business rule is to turn into the skid whilst gently accelerating, and only after regaining control, turn out of the skid. *Knowing a problem exists and knowing the decision levers available does not guarantee that the right lever(s) will be pushed in the right direction.*

The assumption that a "good" Balanced Scorecard will necessarily result in managers making "good" decisions based on indicator feedback is debateable. There is considerable research to suggest that the assumption is invalid, especially in the face of delayed feedback.

SYSTEM DYNAMICS AND PERFORMANCE INDICATORS

There is abundant research in system dynamics[8], as well as in economics and psychology suggesting that managers have great difficulty managing dynamically complex tasks. Sterman

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[7] Department of Defence. *Defence Managers' Toolbox (Incorporating the Commonwealth Managers' Toolbox).* Canberra, June 1999

[8] Sterman, J. Modelling Managerial Behaviour: Misperceptions of Feedback in a Dynamic Decision Making Experiment. *Management Science*, 1989, 35(3), 321-339.

Paich M, & J Sterman. Boom, Bust and Failures to Learn in Experimental Markets. *Management Science*, 1993, 39(12), 1439-1458.

argues persuasively from his work at MIT's Sloan School of Management, that there is "systematic misperception of feedback" especially when there are delays in the system.

In further research at MIT, where graduate students had full information, training, incentives and opportunities for gaining experience, Diehl and Sterman still found poor managerial performance in the face of variations in feedback strength and delay.[9] They argue that the mental constructs and heuristics that managers bring to bear on complex tasks are fundamentally dynamically deficient.

> *"Subjects were unable to account well for delays and feedback effects because (1) people's mental representations of complex tasks are highly simplified, tending to exclude side effects, feedback processes, delays, and other elements of dynamic complexity; and (2) even when these elements are known, people's ability to infer correctly the behaviour of even simple feedback systems is poor."*

The implications of such findings is that decision support tools which can address such feedback dynamics are essential for managing complex environments. In the business environment this translates to the development of "management flight simulators" which can allow managers to test the dynamic responses to strategic decision making.

As noted earlier, Kaplan and Norton argue that the Balanced Scorecard should be based on the metaphor of the flight simulator, not a dashboard of instrument dials.

> *"Like a flight simulator, the scorecard should incorporate the complex set of cause-and-effect relationships among critical variables, including leads, lags, and feedback loops that describe the trajectory, the flight plan, of the strategy."* [10]

System dynamics software enables just this, the creation of 'management flight simulators' which integrate with the corporate Balanced Scorecard system. Managers can 'learn' how performance criteria affect not only their decisions but the performance of colleagues and of the organisation. They can also test the longer term implications of different decision rules.

BUILDING A PUBLIC SECTOR DYNAMIC BALANCED SCORECARD

The 'Customers' of the Federal Public Sector

The 'Customer Perspective' of the public sector BSC is much more complex than that for a private sector firm. In the public sector context, the prime customer (i.e. the agent who pays for a reciprocal service) is the Minister on behalf of the Government. But Departments also have a legal requirements which set up 'customer relationships', especially to the Auditor General and to the Parliament in respect of 'governance', EEO and OH&S.

In those cases where Federal Departments provide services direct to the public, they are required to prepare and implement a service charter, providing a clear 'customer relationship'.

Thus it is suggested that are four 'Customers' who may need to be addressed in a BSC:

Smith, V, G Suchanek and A Williams. Bubbles, Crashes and Endogenous Expectations in Experimental Spot Asset Markets, *Econometrica*, 1988, 56(5), 1119-1152.

Funke, J, Solving Complex Problems: Exploration and Control of Complex Systems, in R Sternberg and P Frensch (eds.), *Complex Problem Solving: Principles and Mechanisms*. Erlbaum Assoc., New Jersey, 1991.

9 Diehl, E and J Sterman. Effects of Feedback Complexity on Dynamic Decision Making. MIT Sloan School of Management, Research Report D-4401-1. March 1994.

10 Kaplan,RS and Norton DP, "Linking the Balanced Scorecard to Strategy", *California Management Review*, Vol. 39, No. 1, Fall 1996. p.64.

- *for most departmental activities,* the Minister, and through him/her, the Government;
- *in respect of governance,* the Auditor General and Parliament, as well as the Minister;
- in respect of organisational health (OH&S, EEO etc) Parliament, the Minister, staff;
- *for service delivery activities,* the corporate or individual service recipients.

These and other considerations have led us to propose that a 7 Sector Balanced Scorecard may be more appropriate for federal agencies that the 'classic' 4 sector model.

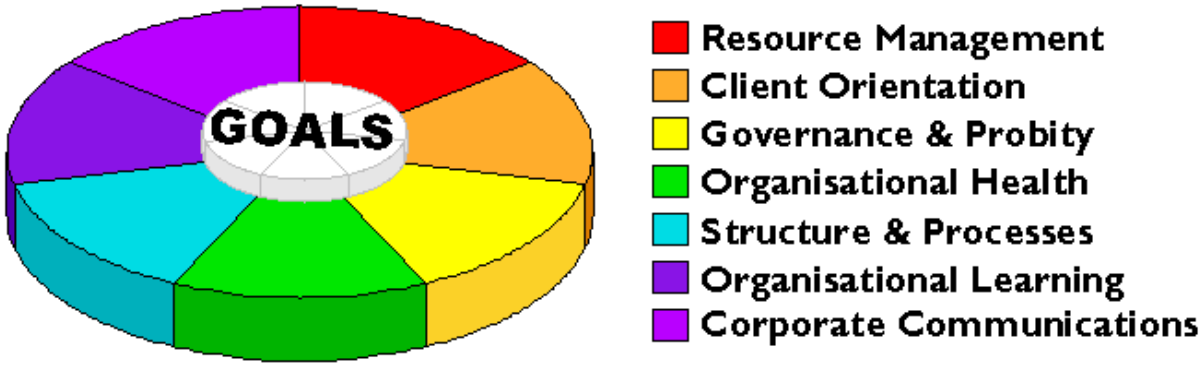

Figure 2: Seven Sector Balanced Scorecard for Government

The following material summarises research done in a number of government agencies designed to build this seven sector dynamic Balanced Scorecard

Dynamic Balanced Scorecard - Integrating System Dynamics & BSC

The BSC template that has been developed focuses on the relationship between managerial responses to any 'workload-resourcing' gap (the 'Capacity Gap'), and how this impacts on the first two 'Customers' above. The model outputs relate specifically to output quality index; probability of fraud / probity incidents; and probability of major OH&S / EEO incidents.

The following causal loop diagrams illustrate the mechanisms by which these are impacted by departmental operations. The interrelationships between the respective work area outputs and their impact on achievement of outcome indicators is subject of a separate study.

Resources Performance Management in the Federal Public Sector

The quantum of funds made available to a Minister to implement Government programs is the end result of a complex interplay of macro-economic deliberations, ministerial bargaining and political judgement. Issues regarding what can be delivered (in terms of quality and quantity) for the proposed funds are significant inputs. But such relationships are largely approximations. Lack of skilled management (for example as a result of high turnover or overwork) can result in errors in estimating required workload.

When the Government has determined its policy, the bureaucracy has only minor leeway in changing the quantum or time schedule of the service. In addition, a variety of unplanned business pressures inevitably impact on planned business. Unforeseen events such as fraud within the Department, a by-election in a sensitive electorate, or a major controversy relating to the Minister's policy responsibility inevitably generate workload which is expected to be 'absorbed'. The resource management task is to deliver the planned outputs within budget.

Figure 3 illustrates interrelationships in the resource sector. 'Customer Demand' represents the Government's (through the Minister) expectations which also determines the resourcing

level. It is almost axiomatic that available resources will be less than that required for quality implementation of all the planned workload, let alone the inevitable unplanned demands. Whether the management response to any 'capacity gap' is innovative or dysfunctional is a function of the organisational competencies, which in turn is the result of leadership and investment in capability, the latter balancing short term impacts on recurrent resources.

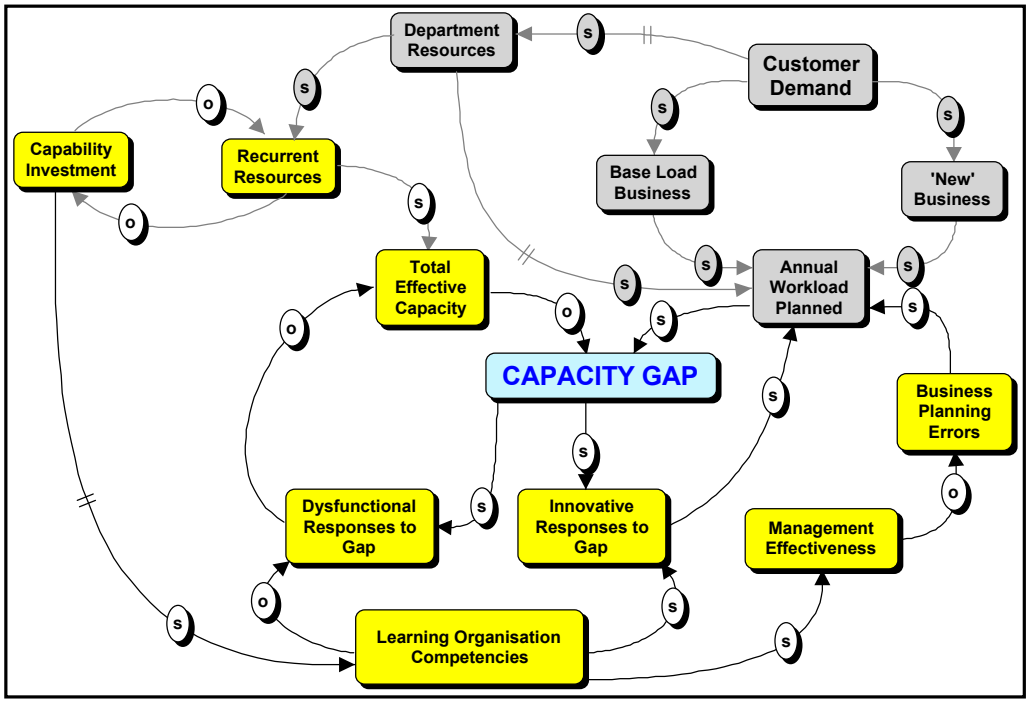

Figure 3: Key Resource Sector Interdependencies in Federal Departments

Figure 4 depicts the staffing module of the Resources Sector in the Dynamic BSC model. This model tracks skill levels of senior executives, executives, technical and administrative support staff, based on staff turnover rates and time at each level to reach full efficiency. Work is underway to incorporate the human capital accounting concepts of Eric Sveiby.

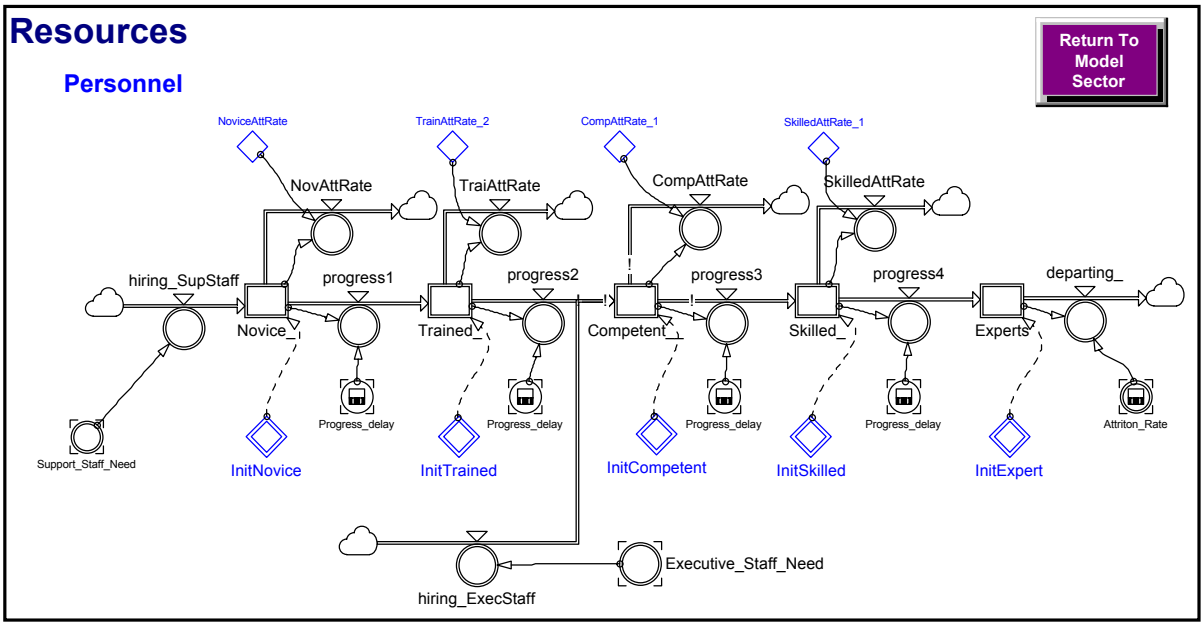

Figure 4: Staff Resources Segment of Dynamic Balanced Scorecard Model

The Characteristics of the Internal Processes in the Federal Public Sector

The core processes in a Federal Department are essentially the same as for the private sector: establish direction; acquire resources; provide capability; and execute the mission.

Whilst the Government establishes the policy and program outcomes that are to be achieved in exchange for the financial resources, management translates the vision and allocates the capabilities to achieve the delivery of agreed outputs. Resource management focuses on achieving results through the delivery of outputs through application of management skills, technical, contract management and service delivery skills etc. Once the budget framework is set, departmental managers have limited scope for obtaining extra resources. Any increase in workload, or workload underestimate, typically will be addressed by working harder:

- more intense and longer hours of work (unpaid overtime)
- reduction in time devoted to training and development (formal or informal)
- redirection of 'management time' to 'task time'
- deferring some work (which simply postpones the day of reckoning) and
- reducing quality of inputs (e.g. through cutting background research effort) or outputs

As illustrated in Figure 5, if such responses are prolonged, they tend to bring about dysfunctional feedback effects which eventually increase the capacity gap, through increased re-work, falling moral, increased staff turnover.

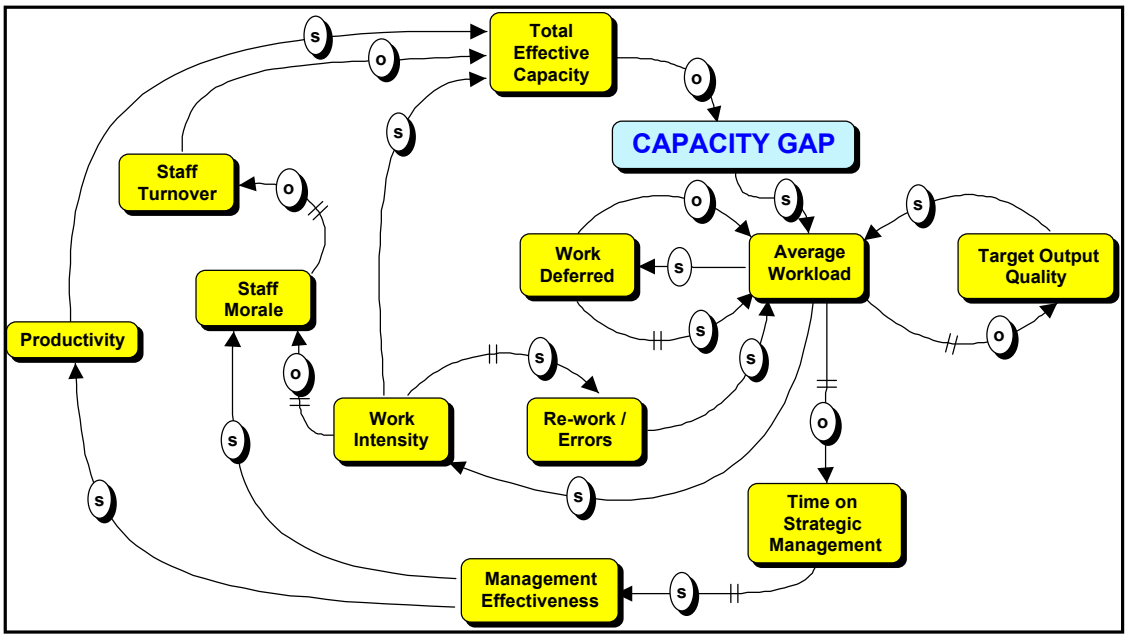

Figure 5: Key Interrelationships Impacting on Internal Processes

Where there is true leadership and a culture characterised by the 'learning organisation' one could expect innovative responses to any significant or prolonged 'capacity gap'. In essence such innovation changes the 'rules of the game' and achieves the end result much more efficiently. There are many local examples of such behaviour across the bureaucracy, but at this juncture the authors would be sparing in their application of 'learning organisation' to Departments as a whole. Accordingly, only dysfunctional responses, as illustrated Figure 5, have been incorporated in to the Dynamic Balanced Scorecard at this stage.

Figure 6 is an extract of the Dynamic BSC model's Internal Process Sector, corresponding to the causal loop diagram above. The module draws its base data from spreadsheet, including: annual work plans; new policy and extra ministerial projects; outsourcing options etc.

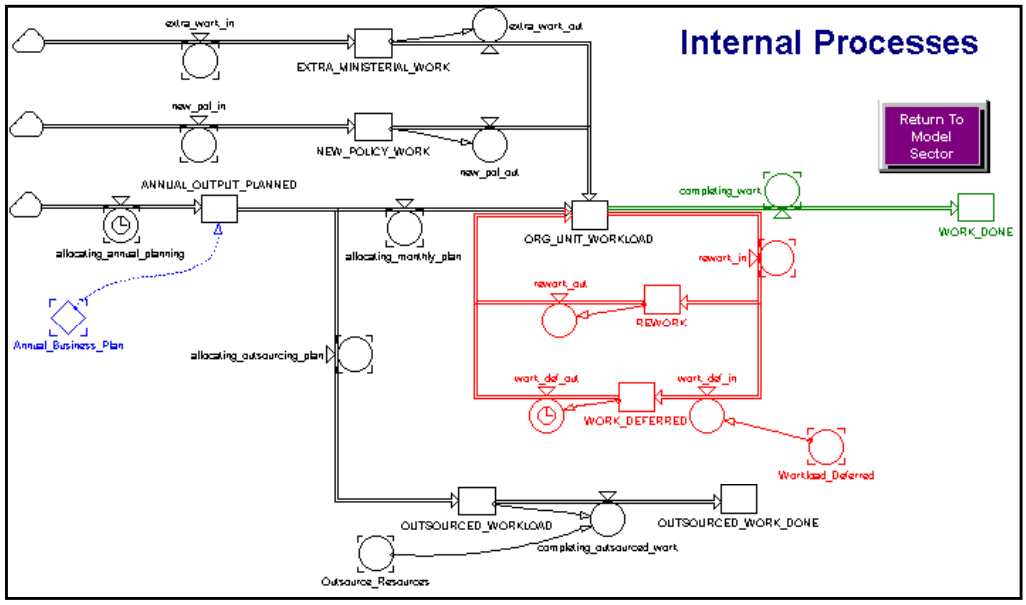

Figure 6: Internal Process Sector of the Dynamic BSC Model

Innovation and Learning in the Federal Public Sector

Recruitment standards to the Australian Public Service are high and career training has a high priority. At the same time, work pressure and unpaid overtime have increased significantly over the past 15 years. This acts as an impediment to self-development. Also, in the face of work pressures, formal staff development tends to be the first area to be constrained. Figure 7 shows the key causal relationships impacting on the learning and growth sector.

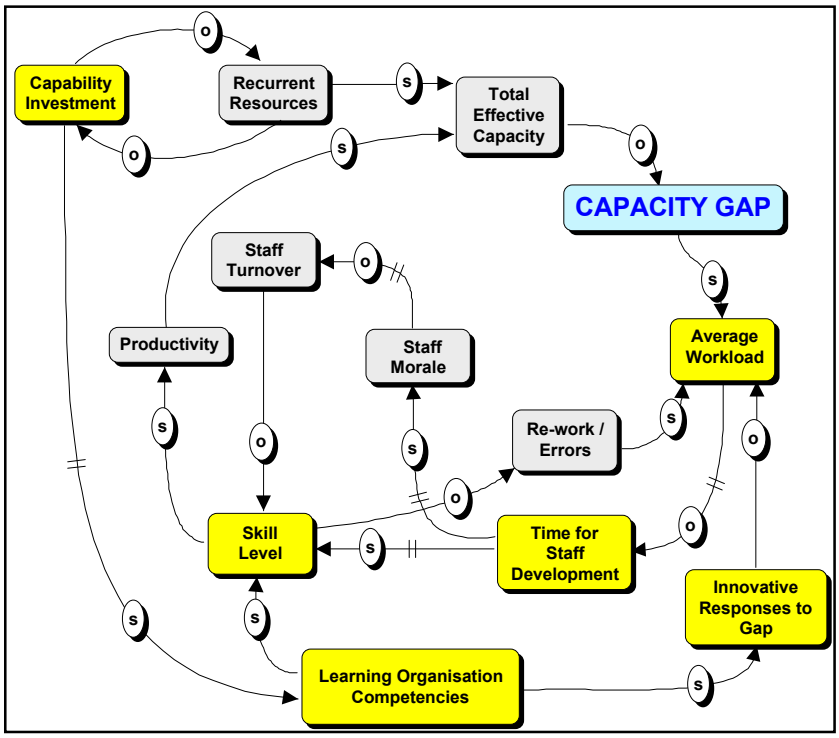

Figure 7: Key Interrelationships Impacting on Learning & Growth

Corporate Governance & Corporate Health

We have been undecided whether corporate governance and corporate health should be regarded as sectors in their own right of the Federal Public Sector Balanced Scorecard. On the one hand, Corporate Governance might be viewed as a key indicator in the Customer Sector, whilst Corporate Health might be an indicator for the Internal Process Sector. On the other hand, failures in these areas tend to have major political implications for the Minister and the Government as well as significant feedback interrelationships with the other sectors. This suggests that they might appropriately be considered as sectors in their own right. A firm decision has yet to be made in this regard.

The Australian National Audit Office (ANAO) defines corporate governance to encompass authority, accountability, stewardship, leadership, direction and control.[11] The dynamics BSC model, at this stage, uses fraud events as a general surrogate for the effectiveness of governance across the broad range of departmental activities.

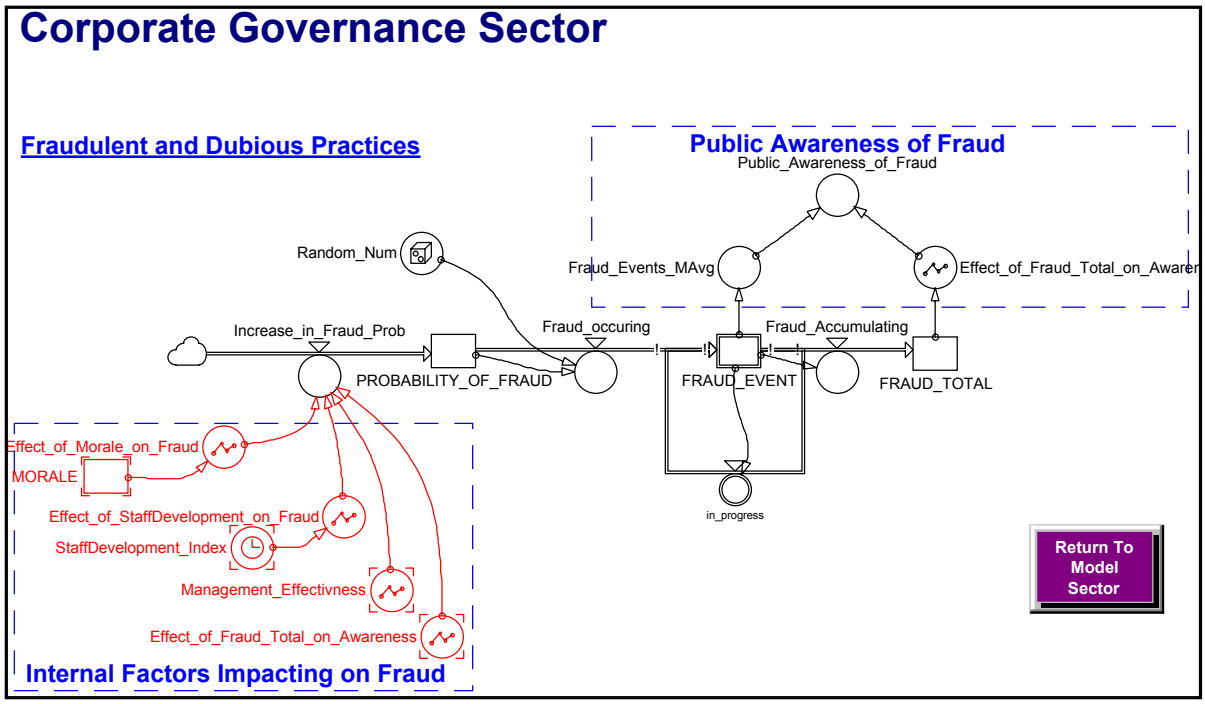

Figure 8: Corporate Governance Sector of Dynamic Balanced Scorecard

Model Output

In the current prototype there are key output screens: the 'flight simulator' panel (Figure 9) and the BSC Screen (Figure 10) as well a subsidiary detail charts and graphs which give finer detail.

In the current version, the model simulates an organisation for a three month period, advises the manager of the 'capacity gap' and the current 'scorecard' situation in respect of output quality (client sector), resources KPI's, internal process KPI's, Corporate Governance and Staff Development. The manager, through the control panel, determines how any emerging 'capacity gap' will be addressed, given the choice of:

- switching a % of strategic management time onto the excess workload

[11] ANAO, *Applying the Principles and Practice of Corporate Governance in Budget Funded Agencies,* Australian Government Publishing Service, Canberra 1997.

- switching a % of staff development time on to the excess workload
- absorbing the excess workload through reduction in output quality

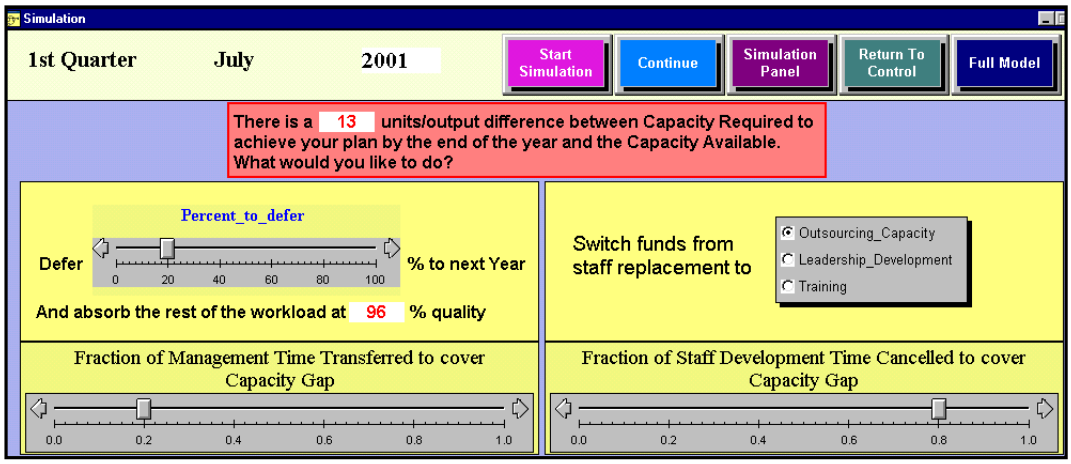

Figure 9: Dynamic BSC Simulator Control Panel

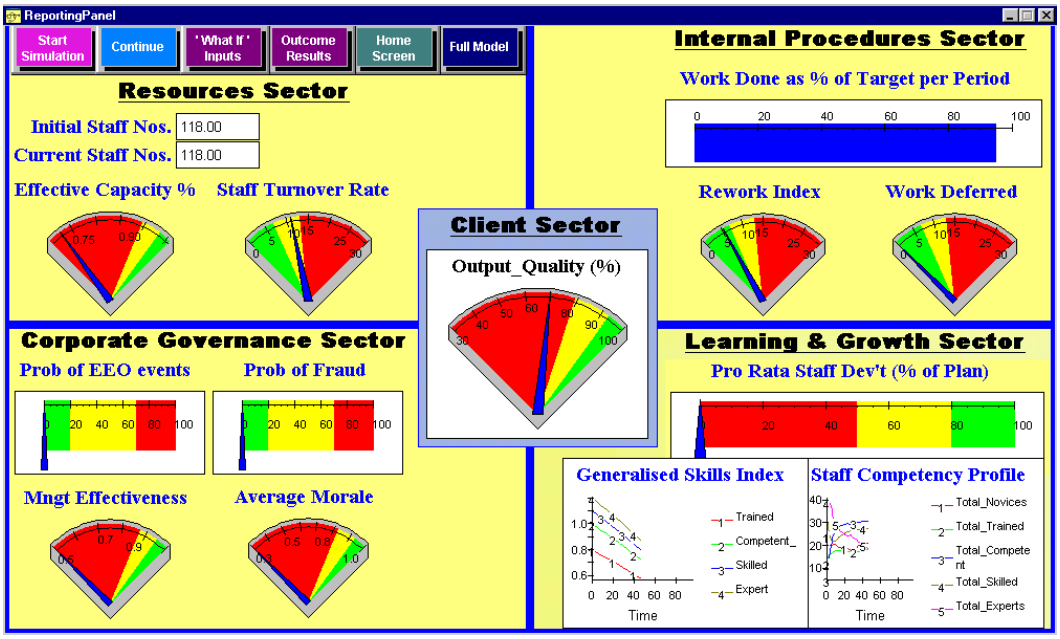

Figure 10: Illustrative Output Screen for the Dynamic Balanced Scorecard

FUTURE DEVELOPMENTS

This paper has highlighted some serious shortcomings of the Balanced Scorecard. Solutions have been suggested. In particular, system dynamics modelling can be used, as an adjunct to the corporate BSC, to provide 'management flight simulators' which *"incorporate the complex set of cause-and-effect relationships among critical variables, including leads, lags, and feedback loops that describe the trajectory, the flight plan, of the strategy"*.

A prototype dynamic scorecard has been built drawing on the experience of public sector managers and on published research into organisational behaviour. The next step is to validate the model parameters in an organisation and test its efficacy in supporting management decision making.