

DEVELOPMENT AND DESIGN OF A 'DYNAMIC' BALANCED SCORECARD IN LOCAL GOVERNMENT

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Abstract

In the information economy, where managers are generally suffering from an overload of information, performance measurement systems are being used as filtering tools to focus attention on the main goals of a firm. However, despite the potential of performance measurement systems to act as filtering and focusing devices, there remain concerns that current systems are inadequate for these uses. This paper focuses on the design and development of a 'dynamic' measurement system that addresses a number of current concerns. Specifically, a case study carried out on a district council in New Zealand shows that, by extending the performance system design itself to include both a pre-design and a post-design phase, the resultant performance system is well thought out, well integrated, and has a future focus thought to be missing from many current systems.

Key words: systems thinking, system dynamics, balanced scorecard, performance measurement

Introduction

Managers in the information age face a business environment characterised by change and uncertainty (D'Aveni, 1995). Survival in this environment depends on being able to make decisions based on timely and accurate information. Although access to information is extremely easy (with communication technologies such as the internet making information readily available), access alone does not help managerial decision making (Shapiro and Varian, 1999). Rather, easy access to information results in confusion as managers can access too much, rather than too little information. For this reason, ways to disseminate, filter and use available information is critical to decision making in the information age (Corrigan, 1998). In the words of Nobel Prize winning Herbert Simon, "... a wealth of information creates a poverty of attention..."

Performance measurement systems are tools designed especially for the task of focusing management attention on critical aspects of a firm's strategy. For this reason, there is an increasing focus on performance measurement systems as filtering and dissemination tools in a world that is overloaded with information.

However, despite their obvious usefulness as filtering devices, concerns abound that performance measurement systems in practice inadequately capture and use the available information. These concerns include criticisms about poorly thought out, and poorly integrated measures (High Performance Systems Inc., 1999; Sloper et al, 1999). There are also an increasing number of criticisms being made about the generally 'static' nature of measurement systems, which focus on the past rather than the future (Takikonda and Takikonda, 1998; Richmond, 1999; Kreutzer, 1991).

An ideal measurement system would be developed in such a way that these concerns are addressed. This paper focuses on the design and implementation of a Dynamic Balanced Scorecard in a local government setting. The emphasis on a thorough design process results in a performance system which has the capability of addressing the concerns raised about measurement systems as a whole.

The Three Phase Design Process

The Dynamic Balanced Scorecard which was developed and implemented in the organisation under study (known as Alpha District Council) uses the well-known Balanced Scorecard as its central system. This dynamic performance system is developed by extending both the front and back end of the traditional balanced scorecard development process with non-linear visualisation and simulation techniques. Rich contextual design at the front end, coupled with a computer simulation tool that allows what-ifs and access to real time data at the back end, make the resultant dynamic balanced scorecard a valuable performance system.

Development of the system takes place in three stages, which are:

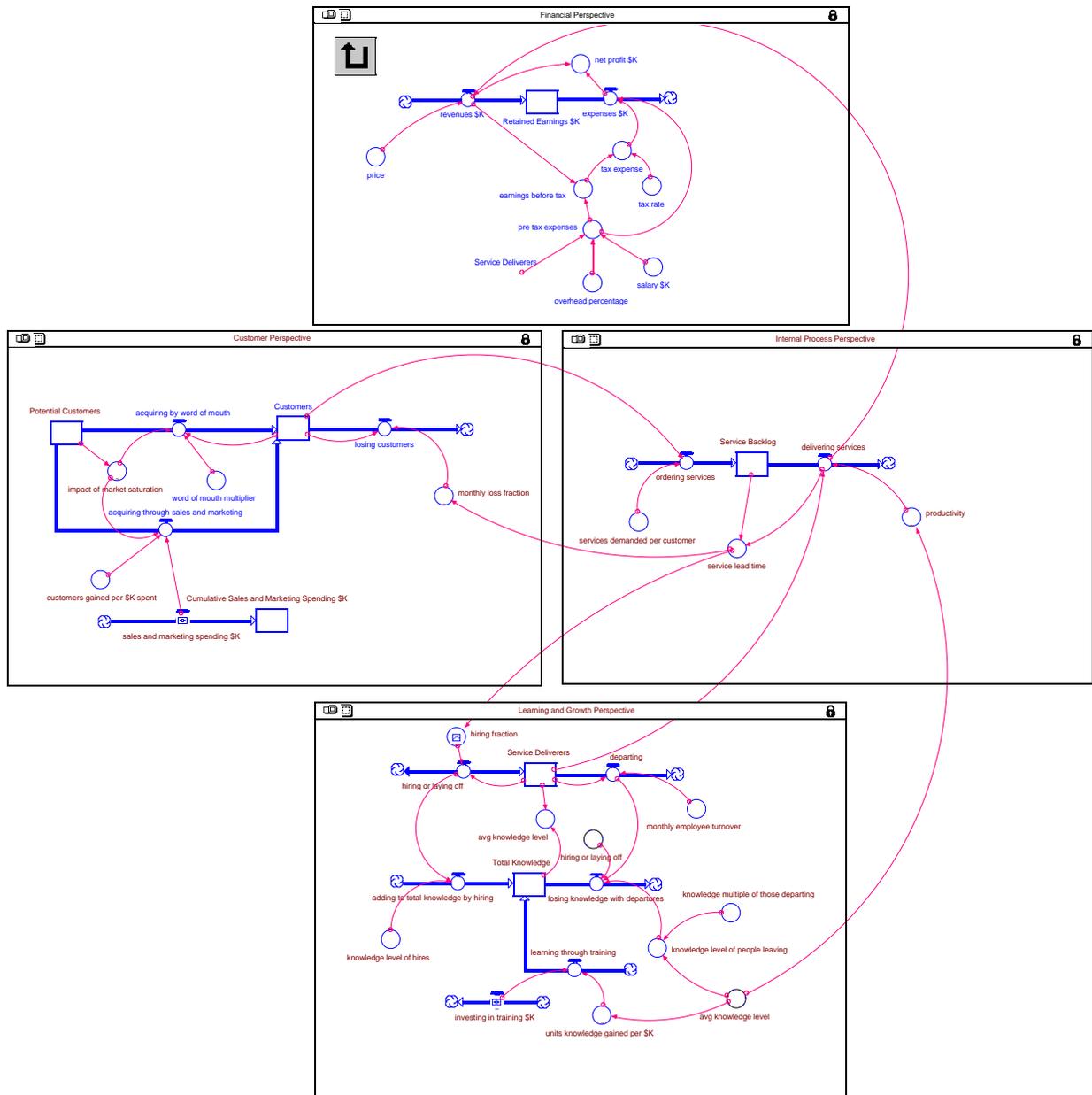
1. Pre-Design: Environmental and Organisational Analysis using the Rich Picture technique (Checkland and Scholes, 1999)
2. Design: Development of the Basic Measurement System using Balanced Scorecard design (Newing, 1995; Kaplan and Norton, 1992; Kaplan and Norton, 1996)
3. Post-Design: Extension of the Measurement System using System Dynamics (Roberts, 1978; Davis and O'Donnell, 1997; Anderson and Johnson, 1997)

These three phases are described in detail next, using examples from Alpha District Council to show how the combination of techniques results in applicable, well thought out and integrated measures. The system that results visually shows interconnections and identifies lead (future-focused) measures. The visual causal loop relationships also provide a way of understanding time lags between measures, which are normally missing from measurement systems. The resultant computer model is also capable of being used to examine possible futures through what-if analysis, and, if developed in conjunction with an organisation's information system, is also capable of accessing real-time data from the organisation itself.

It is useful at this stage to look at an example dynamic scorecard to get an overview sense of the type of visual simulated model that results from using this intensive three phase

design process. Figure 1 below shows an example, which has four interrelated sectors or perspectives named to match the traditional balanced scorecard outline, i.e. Financial, Customer, Internal Business and Innovation and Learning (Kaplan and Norton, 1996). The resultant dynamic scorecard also uses the stock and flow language of system dynamics to represent the key performance indicators or critical success factors within the performance measurement system.

Figure 1: Example of a Dynamic Balanced Scorecard



Source: High Performance Systems, Balanced Scorecard Model Library, www.hps-inc.com

To understand Figure 1's workings, it is useful to walk through a chain of the model's structure. Imagine that we have just hired a new worker. This activity is illustrated by the flow in the top left of the innovation and learning perspective. By hiring a new worker we increase the stock of service deliverers. The logic says that as we increase the number of service deliverers we increase our ability to deliver services. This linkage is illustrated by the connector between the stock of service deliverers and the flow of delivering services in the internal process perspective. As we deliver more services we generate more revenue, shown as the flow of revenues (\$K) in the financial perspective.

By following through all chains of Figure 1's structure, we can see how such a model generates a picture of the inherent inter-linkages and relationships that exist in any performance measurement system. A dynamic scorecard model such as the one shown in Figure 1 enables users to visualise and understand these inter-linkages clearly and easily.

The Case Study Example: Alpha District Council

Alpha District Council, a local government organisation in New Zealand, developed and implemented a Dynamic Balanced Scorecard in the year 2000. The introduction of a dynamic scorecard was initiated by management, who believed that measurement data was not being used effectively within the organisation. In order to overcome the fragmented approach of their existing measurement system, management of Alpha District Council hired a specialist Systems Thinking consulting firm (Synergia NZ. Ltd.) to help them develop an integrated and dynamic system. The Synergia consultants used the three-phase design approach described in this paper, which is detailed next.

Pre-design phase: rich picture development

In order to ensure that the measures used in a scorecard are the right ones, managers need to look beyond their existing set of measures. A starting point for every measurement system design, regardless of whether it is a large company-wide system or a small executive feedback form, is a pre-design phase. A pre-design phase focuses on an understanding of the organisation and its environment. This approach ensures that the system is developed from the outside-in, so that designers understand what is actually required of the system, and thus from the outset ensure that the best possible solution can be offered. By understanding the current situation before designing the actual measurement system, it is far more likely that the resulting measurement system will be appropriate and useful. Essentially the context must be described first before the available measurement information can be filtered and disseminated.

A number of pre-design techniques exist. The most common of these is the traditional SWOT analysis, which focuses on the identification of strengths, weaknesses, opportunities, and threats for the organisation under question. However, there is a growing school of thought that suggests the pre-design phase is more powerful if it is visual in nature. Soft systems methodology (SSM) literature puts forward the use of the Rich Picture approach as an especially powerful context-setting visual tool (Checkland, 1999; Checkland and Scholes, 1999).

The 'Rich Picture' visualisation technique was used as the main pre-design tool at Alpha District Council. Development took place through a series of six group discussions with managers, over a period of 3 months. Questions asked of managers during these initial sessions were key to understanding the design setting and the intended use of the performance measurement system. The questions included:

1. What does the community value?
2. What is Alpha District Council all about?
3. What does Alpha District Council stand for?
4. What issues does Alpha District Council face?

One key performance measurement aspect of Alpha District Council's situation that became clear during the rich picture phase related to community involvement. That is, the council was found to be severely lacking in community engagement, with a resultant lack of knowledge of community needs. Figure 2 shows the part of rich picture development that led to this knowledge.

Figure 2: Portion of Rich Picture Showing The Need for a Community With One Coherent Vision

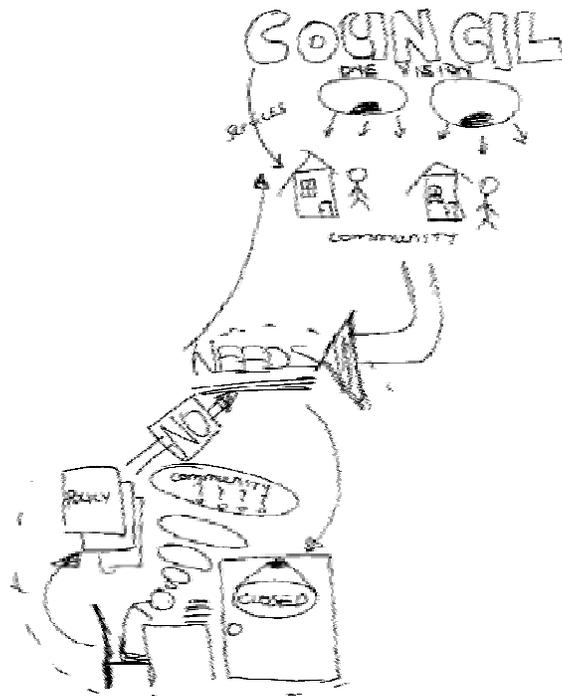


Figure 2 can be explained in detail as follows. Starting at the top, it can be seen that the council is divided into separate communities. Rather than taking the view of a council with one vision, some people see the council as being divided geographically and politically into separate areas. This viewpoint leads to different area departments delivering services with only their own communities in mind, rather than the whole district. This in turn leads to fighting over a limited pile of resources and hence the sub-

optimal delivery of these services for the whole district. This leads to debates around whether the council was and/or should be seen as *one* council or a number of smaller area departments, with subsequent policy needing to reflect this.

In terms of the measurement system, this portion of the rich picture highlights that, for the council to effectively understand and meet community needs, it needs to increase its community engagement. Specifically, from a performance measurement perspective, this portion of the picture raises a number of issues, which are:

1. How do we measure community involvement?
2. Can we measure community involvement?

Following the rich picture development, Alpha District Council used a set of other soft systems methodology (SSM) tools to complete their pre-design phase. These techniques are not detailed in this paper, but can be studied by following the SSM process as detailed in Lane and Oliva (1998). The comprehensive set of SSM inquiry tools, overlaid on the rich picture development, enabled Alpha District Council to gain a collectively agreed understanding of the current situation.

Design: The Balanced Scorecard extended to include Key Success Loops

The dynamic scorecard design took place next, and incorporated what was learned from the rich picture development and other SSM techniques.

Development of the dynamic scorecard merged the two steps of balanced scorecard design and system dynamics post-design into one iterative process. This is because the elements of integration and feedback that are core to a system dynamics (SD) approach (Forrester, 1991) need to be part of the scorecard design from the start.

The merging of these two approaches was broadly carried out by replacing balanced scorecard Key Performance Indicators (KPIs) (Kaplan and Norton, 1996) with Key Success Loops (KSLs) (Kim, 1997). The steps of each of these approaches are summarised below for comparative purposes.

Traditional balanced scorecard development is driven by the assumption that measures are driven by the organisation's strategy, vision and mission (Kaplan and Norton, 1996). Consistency with the goals of the firm is a critical element of scorecard development, with resultant steps:

1. Clarify and translate vision and strategy
2. Develop a set of Key Success Factors (KSFs) that relate to the identified strategy
3. Develop a set of Key Performance Indicators (KPIs) that relate to the KSFs identified in step 2.

Kim's (1997) KSL approach also assumes consistency as an important element, but extends the KPI approach by recognising links between measures even as they are

developed. In this way, assumptions about cause and effect, potential timing differences, and an inherent process focus whereby measures are now seen in terms of their chains or loops of impact, is introduced into the measurement system development. Kim's KSL loop development includes the following steps:

1. Clarify and translate vision and strategy
2. Brainstorm a list of KSFs and prioritise the list.
3. Start with the top priority KSF and identify a reinforcing loop that will be self-sustaining.
4. Repeat Step three with all the high priority KSFs. Try to integrate all the loops into a single diagram.

The resultant KSLs are then easily translatable into a system dynamics software simulation tool such as *ithink* (Anderson and Johnson, 1997).

System Dynamics Model

By following Kim's technique, numerous inter-linkages between separate loops were found for Alpha District Council, and a picture of the whole measurement framework began to build. The KSL diagrams translated to Causal Loop Diagrams (Kim, 1997) easily, but the stock and flow language of system dynamics was missing. This extra step (the addition of stock and flow terms to the model) is important as it allows simulations to be carried out once the final model has been completed (Sterman, 2000). That is, stock and flow capability allows management to use actual (or approximate) measurement data to predict end effects on other measures once the model is completed. Likewise, management can use the stock and flow elements to change measurements within the system loops to visualise the effect that these changes have on other measures, as well as the firm as a whole.

The iterated building of the SD model uncovered a number of issues for Alpha District Council. For instance, following on from the rich picture example given earlier, specific questions were raised with respect to how to measure the Council's capability to engage with the community. These questions included:

1. How do we measure community engagement?
2. Why are we only capturing 16% of customer queries?
3. Are the measures we have now relevant to the whole district?
4. What is a satisfactory level of community satisfaction?
5. What measures do we need in these areas to convey this understanding?

As Alpha District Council appeared to have few measures in place to measure community engagement, it became clear that research was needed to uncover what performance measures would be suitable here.

The process taken to uncover available measures was quite straightforward. Firstly, research was conducted into Alpha District Council's entire measurement lists. It was found across the entire organisation that there were minimal measures that were suitable representations of community engagement. From this, other local government

organisations in New Zealand and overseas were investigated with the aim of uncovering how they measured various elements of engagement. Several suitable measures were uncovered this way that Alpha District Council ended up adopting. These measurements included such elements as the number of council-based exhibit activities at shows and field days, and the percentage of council agenda items where the public is excluded.

The community engagement measurement issues reflect only one aspect of the measurement investigations that went on during the scorecard development phase. Alpha District council also found that they had few measurements for the balanced scorecard heading 'innovation and growth', and likewise few for internal policies and processes. Thus the process of SD model development provided a focus for determining which current measures that the Council captured were useful and which were not. Those that were not useful were excluded from the system, and the process also encouraged the Council to find new and appropriate measures when none existed.

The SD model development phase also highlighted some structural issues that were of importance to the resultant measurement system. For instance, the linkages in the model showed a direct relationship between policy development and community engagement that had not previously been perceived.

Finally, the resultant SD model allowed for easy identification of 'lead' measures: i.e. those measures that impact other measures over time. Measures that are 'upstream' (at the start of an arrow as shown in Figure 1) of others can be used as indicators of impacts on other measures downstream. By simulating potential changes in these upstream measures, management is able to visualise end impacts on other measures and thus move to a more proactive mind set.

Conclusion

The brief discussion of Alpha District Council's design and development of a dynamic scorecard does not tell the full story of the complex, iterative and essentially transformative process that the council went through during its performance system development. The process of developing a full SD model to the point where it could be used for simulation and what-if predictions took a full year, and involved over twenty meetings with management and affected staff.

However, the result was a system that the council was very happy with, largely because they believed that their measurement system better represented the Council's reality in a rich and easily understood fashion that was previously unavailable to them. In particular, the resultant Alpha District Council 'high level map' (the equivalent of Figure 1) is now commonly used to explain the role and goals of the council to newcomers and staff, enabling a consistent understanding of the measurement system and goals of the organisation to be passed on in a very visual way. This usage fits with the growth of interest in strategy mapping that the developers of the balanced scorecard themselves (Kaplan and Norton, 2000) recognise as a potential key to performance system success.

The resultant system that resulted from the strong mix of non-linear visualisation techniques (rich pictures and causal loop diagrams), coupled with simulation modelling techniques, also does not suffer from many current system criticisms.

To explain, the system, as it developed, clearly acted as a filtering device for management. This was evidenced during the SD model development phase, which involved the review of existing council measurements. Because of the rich pre-design phase that had clarified the council's situation to all concerned, management was easily able to include new measures and dismiss old ones that were not relevant during this period. Thus the entire outside-in process enabled prioritisation of measures in an effective way. It is important to note that decisions on which measurements to include in the scorecard may have been less effective if the council had tried to circumvent the initial pre-design phase. For example, allocating their existing measures into a pre-set balanced scorecard framework would not have reflected the importance of community engagement, or enabled management to see how tightly coupled community engagement is to policy development.

Thus the importance of the pre-design phase is clear, as the resultant measurements were clearly well thought out and appropriate. The visual nature of the pre-design phase enabled 'outside of the box' thinking, which in this case can be seen through Alpha District Council's realisation of the importance of community engagement in their entire operation, and subsequent search for measurements that could describe this.

The concerns about inadequate capture and use of available information in measurement systems were also mitigated using this three phase design process, as once measures became part of the final SD model, their capture within the organisation became a formal process. Likewise, some readily available information was dismissed as not critical to the performance system, indicating that the system operated as a filtering tool. Just because information was available did not mean that it was either relevant or important for management to capture. The system itself was designed to filter information and hence prevent overload, rather than add to it through the addition of less valuable measures.

The development of a scorecard based on key success loops right from the start also resulted in extremely well integrated measures. The causal loop approach allowed 'upstream' or 'lead' measures to be easily identified, meaning that Alpha District Council was now able to focus on future as well as historical indicators. This moved them away strongly from their traditionally static measurement approach. Finally, the ability to simulate the effect of changes to key measures using the *ithink* modeling software package (coupled with the ability to access on-line company data through a computer interface) enabled the council to do what-if analysis and learn about future scenarios more easily than had been the case in the past.

In conclusion, the extended design approach detailed here overcomes many of the problems identified with current measurement system approaches. This suggests that more research on good and rigorous performance system design is worthwhile.

References

- Anderson, V., and Johnson, L. (1997). *Systems Thinking Basics*. Pegasus Communications, Cambridge, MA.
- Checkland, P., (1999). *Soft Systems Thinking: A Thirty Year Retrospective*. John Wiley and Sons, London.
- Checkland, P., and Scholes, J., (1999). *Soft Systems Methodology in Action*. John Wiley and Sons, London.
- Corrigan, J. (1998), "Performance measurement: knowing the dynamics." *Australian Accountant*, 68 (9), 30-31.
- D'Aveni, R.A. (1995) *Hyper-competitive Rivalries: Competing in Highly Dynamic Environments*. Free Press, New York.
- Davis, A., and O'Donnell, J., (1997). "Modelling Complex Problems: System Dynamics and Performance Measurement." *Management Accounting-London*, 75(5), 18-30.
- Forrester, J., (1991). *System Dynamics and the Lessons of 35 Years. The Systemic Basis of Policy Making in the 1990s*. K. De Greene (Ed). M.I.T Press, Cambridge, MA.
- High Performance Systems, Inc., (1999). *Introduction to Systems Thinking*. High Performance Systems, Inc., Hanover, NH.
- Kaplan, R., Norton, D., (1996). *The Balanced Scorecard: Translating Strategy into Action*. Boston, Massachusetts. Harvard Business School Press, MA.
- Kaplan, R., Norton, D., (1992). "The Balanced Scorecard - Measures That Drive Performance." *Harvard Business Review*, 70(1), 71-79.
- Kaplan, R., and Norton, D., (2000). "Having trouble with your strategy? Then map it." *Harvard Business Review*, 78(5), 167-176.
- Kim, D. H. (1997). "From Key Success Factors to Key Success Loops." *The Systems Thinker*, 8(5), 6-7.
- Kreutzer, W. B. (1991). "A Systems Thinking Approach to Executive Information Systems." *The Systems Thinker*, 3(7), 8-9.
- Lane, D., and Oliva, R., (1998). "The greater whole: towards a synthesis of system dynamics and soft systems methodology." *European Journal of Operational Research*, 107(1), 214-235.
- Newing, R. (1995). "Wake up to the Balanced Scorecard!" *Management Accounting-London*, 73(3), 22-24.
- Richmond, B., (1999). *Using the Balanced Scorecard to Leverage Penetration of Systems Thinking*. High Performance Systems, Hanover.
- Roberts, E. (Ed.), (1978). *Managerial Applications of System Dynamics*. Productivity Press, Cambridge, MA.
- Rosser B (1999). "The Coming Information 'Hyperflow': Key Business Driver", 23 June, Gartner Advisory Services, <http://www.gartner.com/>
- Shapiro, C., and Varian, H., (1999), "The art of standard wars." *California Management Review*, 41(2), 8-32.
- Sloper, P., Linard, K., Paterson, D. (1999). "Towards a Dynamic Feedback Framework for Public Sector Performance Management." 1999 International System Dynamics Conference, Wellington New Zealand.

Sterman, J., (2000), *Business Dynamics: Systems Thinking and Modeling for a Complex World*, Irwin Professional Publishers, UK.

Takikonda, L. and Takikonda, R., (1998). "We Need Dynamic Performance Measures." *Management Accounting*, 80(3), 49-51.