

The Management of Urban Water Services - A Study in Long-Term Institutional Dynamics

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Abstract

This paper uses systems thinking to interpret the dynamic interplay between the social, political and institutional forces that have influenced the management of a large urban water authority. This interpretation is used as a framework for assessing recent government initiatives to introduce competition into the water industry. The study is based on 100 years of history of the operation of Melbourne Water and current proposals to vertically disaggregate the business and to use a combination of industry regulation and yardstick competition to manage the industry. The paper attempts to demonstrate the importance of adopting a systemic approach to understanding the complex array of issues involved and to record some of the practical difficulties encountered in using this approach within a highly turbulent environment.

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PART 1- BACKGROUND.

MELBOURNE WATER CORPORATION.

The Melbourne Water Corporation (MWC), formerly known as the Melbourne and Metropolitan Board of Works (MMBW), has provided the City of Melbourne with water and sewerage services for more than 100 years and, from time to time, associated services such as drainage, industrial waste, parks and waterways, urban planning, and bridge and road construction. It currently provides hydraulic services to 3.3 million people covering a geographic area of some 9000 square kilometers. MWC has a turnover of about AUS\$1.3 billion and manages assets with a current cost replacement value of AUS\$11.2 billion. It manages a debt of AUS\$3.4 billion.

THE STATUTORY AUTHORITY MODEL AND THE PRINCIPAL AGENT PROBLEM.

Originally modelled on the structure of London's Metropolitan Board of Works, the MMBW was created as a statutory body in December, 1890. The fundamental concept of such a body is to separate the professional and engineering-based decision making required to develop and manage an urban hydraulic system from political and other parochial interference. In his introduction to the history of the MMBW (see Dingle and Rasmussen, 1991), published as part of its celebration of 100 years of operation, the then Chairman of the Board, Dr Ray Marginson, wrote:

" With the concept of the statutory body the Government of Victoria from 1870 onwards conceived an effective solution to the problems of management in major development agencies. That admirable conservative F. W. Eggleston, in his "State Socialism in Victoria", observed that "policy should be determined on general lines by the state, and embodied in legislation, but its detailed interpretation and execution should be left to managers. The issue of autonomy remains one that is at the heart of the Board to this day. "

Consequently we have a form of the classical principal-agent problem with added problems of having a government with multiple and competing objectives acting as the principal and an authority that quickly establishes a unique knowledge base concerning the system and its operation, as the agent. It is a formula for building a policy and administrative, but not operational, knowledge amongst government bureaucrats, who essentially form a third party to the system.

In other words we have a picture of an industry which needs to operate with a very long-term framework and a strong accountability to the broader community, being managed by a combination of:

- A government process which in general operates in a reactive mode to issues which have become sufficiently politicised that they demand attention. The key outcome of the multiple objective complication is that whatever a government does, there will almost always be an "unintended consequence". For example, the long-term debt and environmental problems which can arise from building a dam to satisfy a community's demand for water.
- A government bureaucracy that is frustrated in its attempts to control the long-term direction of the industry by changes in government and a strong desire by the water authorities to manage with maximum autonomy, very limited resources and within an operating context which demands that the needs of the politicians receive the highest priority, and
- A monopolist operator (the statutory authority) that has the opportunity to establish an extremely strong knowledge base and political position.

Experience has shown that it is not easy to align these objectives. As a consequence the decision mechanisms on major issues are often characterised more by friction than smoothness.

OPERATION OF THE STATUTORY AUTHORITY MODEL.

The early history of the MMBW provides a reference mode for the behaviour of the statutory management structure; a reference mode which has been replicated many times over the MMBW's history and is central to the current restructuring debate. The key elements of this behaviour can be summarised under the following headings:

(The extracts cited are from Dingle and Rasmussen (1991). In reading these extracts it is important to understand something of the political climate prevailing at the time of the formation of the MMBW. The 1890s were the years leading up to the creation of the federation of the colonial state governments in 1901 to form the Commonwealth of Australia. Prior to Federation, Australia was governed by a number of colonial governments in concert with smaller local governments. These arrangements gave rise to Australia's current three-tiered structure of government. Of particular relevance to the formation of the MMBW was the threat posed to the colonial government of the formation of a "Greater Melbourne City Council". The formation of the MMBW was perceived by some as an alternative to this concept- the MMBW was designed to represent the interests of local government and to be independent of the colonial government. This ability to plan and operate hydraulic systems across local government boundaries has been a key competency of both the MMBW and the MWC.)

- Chronic debt and finances integrated into government fiscal and equity policies.

"..... legislation was introduced into Parliament by Premier Gillies on 24 June 1890. The bill proposed the establishment of the Board of Works which would have the authority to build sewers and run Melbourne's water supply. The bill proposed that the Board would take over the debts of the Water Supply Department, some 2,358,934 pounds, an annual interest payment of around, 60,000 pounds and make an extra payment of 800,000 pounds. This last amount represented capital which had been borrowed to build Yan Yean but had already been paid. On the revenue side the new Board would be able to levy a water rate of 6d in the pound, on the net annual value of a property. This generated an income of nearly 190,000 pounds in 1889. It could also borrow to a limit of 3 million pounds.

These terms stunned and angered the municipalities. The Board would be 3 million pounds in debt before it began and must borrow another 3 million pounds to begin sewer construction." (Page 22)

- Public health and environmental concerns.

"During 1890, there were 9,300 deaths in Melbourne. This amounted to a death rate of almost 20 per 1, 000 people, more than double what it had been in the 1880s More than 400 of the deaths in 1890 resulted from typhoid. " (Page 39).

- Economic importance of public works.

"Sewer building also had a big impact on the depressed local economy. In 1900 the editor of the "Building engineering and Mining Journal" made an interesting assessment of the economic impact of the Board's activities during the depression decade: 'At the hour in which the financial interests of the colonies were rocketing to their foundations, the MMBW was commencing its gigantic undertaking.... A country's wealth is estimated by its capacity to employ labour at remunerative rates, and this power, so far as the metropolis of Victoria is concerned, is today largely due to the Board's operations.. " (Page 76)

It also added that public health was rapidly improving and property values would rise as a consequence of being connected to sewers.

- Growth in political power of the authority.

"In September 1898 the Age newspaper had declared that: "Next to Parliament itself, the MMBW is the most important representative body in the colony. In revenue and expenditure, in the importance of the functions entrusted to it, in the number of its employees, in the lofty scale of the salaries which it pays, and the dignity and graceful aristocracy of its presiding officer, it is far ahead of all other local bodies. "" (Page 92)

- Criticisms of the authority and calls for public enquiries.

"They amounted to five broad criticisms- about the method of electing commissioners; about inadequacies of the operation of the committee system; about the wasteful way in which contracts were let and subsequently altered; about the excessive size and cost of management and finally the often-heard cry of extravagant spending. " (Page 92).

An enquiry did eventuate, with the Board coming out unscathed.

- Cut-backs and rationalisation.

A further stage in the history of the Board commenced with the appointment of a new chairman (Carre Riddell) in 1907:

'Against the threats of reform, continuing complaints of excessive spending and widespread belief that the Board was too large, Riddell began the search for economies ... All branches of the Board operations were minutely searched for economies. Thirty clerks were dispensed with and all operations except stores were centralised at the head office. Before long it was necessary to add two extra storeys to the building to create enough accommodation for staff ... The stores branch was investigated by an outside consultant, who found that it was functioning effectively. " (Page 109)

The Board generated its first operating surplus in 1907.

With the exception of some of the more extreme events, these accounts could easily be confused with accounts of similar events in recent years. This cycle of events was to be repeated many times through to the present. To quote Marginson again:

"By 1970, the original distancing of investment and engineering decisions from parliamentary and executive control had developed into such a degree of independence that many people questioned whether such an important area should be so completely outside ministerial direction and democratically -based control. The full-time executive chairmanship married to a mini-parliament of all municipalities widened the gap as the years went by. The emergence of such strong individuals as Sir John Monash and our own Alan Croxford exacerbated the position. "

The 1980's saw yet another enquiry into the governance of the MMBW. Whilst preserving the essential elements of the Statutory Authority model, this enquiry led to the adoption of a more streamlined board structure with both state and local government representation with a part-time chairman and a full-time chief executive officer. These moves can be seen as the first major steps towards the commercialisation of the MMBW and the shift towards corporatisation and privatisation.

Coincidentally, a change of government in 1982 led to new attempts to achieve greater bureaucratic control over the Board. This was to be achieved by making the Board operate under the same water act as all the other much smaller regional and country water authorities. This move was successfully defended by the Board arguing that the management of Melbourne's hydraulic system should not become confused with the issues relating to the management of rural water supplies and the problems of the irrigators. In the background to this is the conflict over city versus rural water rights and the relative costs of water. (In broad terms most rural water

supplies are in need of considerable capital expenditure. The irrigators, who account for 80% of the total water usage, are heavily subsidised while the Melbourne area generates by far the most income and commercial activity.)

CORPORATISATION AND STRUCTURAL REFORM.

Melbourne Water was formed in 1992 following the merger of the MMBW with five smaller neighbouring authorities. It was formed as a quasi corporatised body with a professional board (only partly appointed) and a managing director. Early corporatisation proposals have been overtaken by the institution of new legislation which provides the current (Liberal/Conservative) government with sweeping powers to re-structure government businesses. These moves are based on a strong policy to introduce competition into the supply of government services with the ultimate objective of providing cheaper and more effective services to the community.

Despite the dramatic changes undertaken by the management of the MMBW and subsequently Melbourne Water, including dramatic downsizing- from 9000 in the mid-80s to a current figure of less than 3000, a major shift towards contracting-out, a total move away from a construction-engineering focus to a more commercial, customer service orientation, dramatic improvements in profitability, and strong analytical evidence that any possible gains from increased competition which may result from disaggregating Melbourne Water, are outweighed by the losses in economies of scale, the government has recently announced that Melbourne Water will be split into three "retail" operations and a "wholesale" headworks and tailworks authority. As such it will fit into a state-wide model for the water industry where wholesale prices for water are regulated ex-headworks and in which the retailers operate under licence and on a catchment basis to provide services to nominated levels of service and are subjected to "yardstick" competition.

The new framework is seen by many observers as being largely impracticable from an operational point of view, as providing the mechanism for handing over a major industry with a demonstrated export potential to overseas interests, of limited scope for real competition, as providing a mechanism for subsidising rural interests and a victory for those bureaucrats who have long wanted to gain overall control of the industry.

The advocates for the changes see the changes as delivering sustainable, long-term improvements in mechanisms for allocating resources, benefits in terms of better customer service at reduced cost, improved environmental management and more effective industry regulation. In short, overcoming the perceived problems of the statutory model. (Barton, 1993 further elaborates on these issues).

In many ways the issues are not that dissimilar to those which surrounded the formation of the MMBW in 1890- for example the current major environmental problem relates to the pollution of Melbourne's waterways as a result of an inadequate drainage system, Melbourne Water's AUS\$3.4 billion debt burden, a number of political power plays, and a search for a better management model.

The one factor which is not as prevalent at the current time is the role of local government. Local government bodies' representation on the board was removed at the time of the formation of Melbourne Water. In addition they are currently preoccupied with government moves to restructure them, albeit through amalgamations, not carve-ups! This reduction in influence may, however, be temporary if the issue of the drainage system becomes more politicised in the future. The management of urban infrastructure and its relationship to the broader questions of urban development, environmental management, the role of government and the protection of consumers is a complex one that gets to the very heart of how we manage our society. For the greater Melbourne region the results of a century of management of its water services using the statutory model is that Melbourne now enjoys one of the best natural water supplies in the world- water is harvested in closed catchments and undergoes a minimum of disinfection, and one of the most efficient sewerage systems. Comparative cost and technical efficiency measures are difficult, but a benchmarking study against the UK water industry for the 1992-93 period showed that

Melbourne Water's cost structure was 9% lower than the UK average. (Note that, given the extent of government interference in pricing over a long period of time with the resultant cross-subsidy distortions, price and profitability measures make little sense.)

Time will only tell whether the attempts to infuse competition and privatisation mechanisms will be as successful over the long haul, at least as far as Melbourne is concerned. Clearly the application of long-term franchises in France and the privatisation of the UK water industry despite its criticisms, for example, have brought a new era of commercialisation to the water industry and is making water a truly international industry.

PART 2- A SYSTEMS INTERPRETATION.

The detailed history referred to above provides a rich account of the behaviour of the statutory model of management and suggests a number of clear patterns. It demonstrates a cycle of activities which link the need to address a serious public health (environmental) problem to demands for finance, the attractiveness of clean environments to further urbanisation, the growth in power of the operating authority, the importance of infrastructure development to the local economy and the provision of employment, charges of inefficiency, the conduct of public enquiries, attempts to change the governance structure of the operating authority and success of the MMBW in defending its position and activity reviews of management and operating practices.

These characteristics are represented as a first approximation in the causal loop diagram presented in Diagram 1. The diagram consists of a number of stabilising loops with balancing processes in areas such as population growth, the growth in the authority's power, the ability to finance projects and the prioritisation of projects. The system drivers, however, are the growth processes relating to economies of scale, the growth in operational knowledge and expertise and the economic significance to the local economy. There is also an "unintended consequence" loop in which the growth in public criticism leads to a loss in the authority's power to manage its projects and hence a capability to address issues.

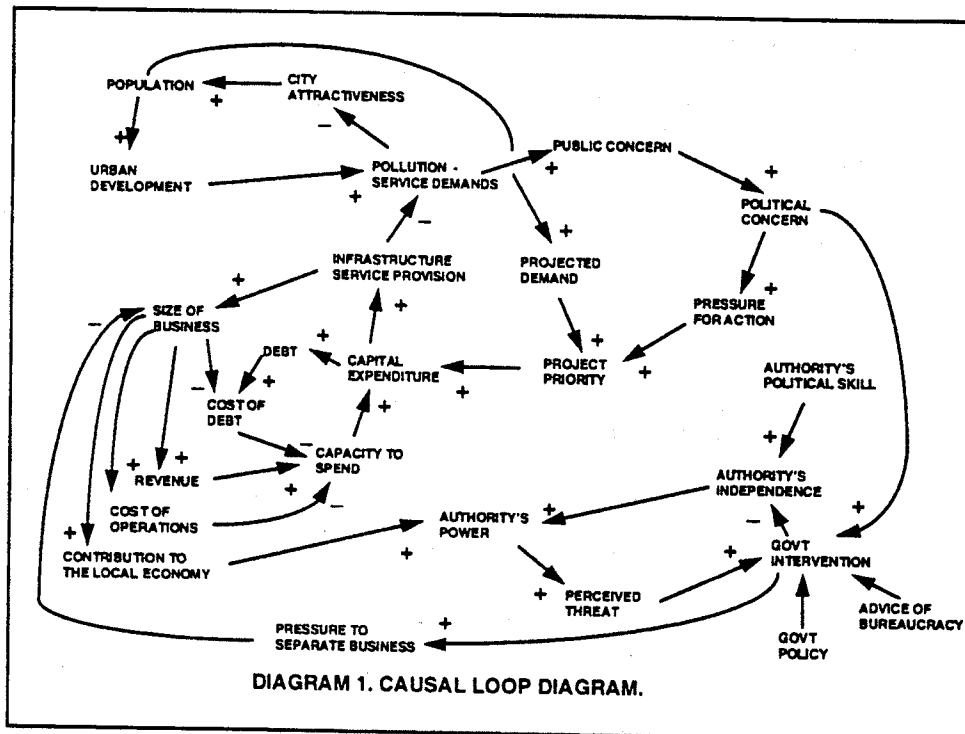


Diagram 2, which graphs population levels and the rate of capital expenditure on water and sewerage systems over the life of the MMBW provides a key reference mode for this management system. Clearly the effects of the post-World War 2 migration program and the related application of strong public sector spending policies had a dramatic effect on capital expenditure rates.

This reference mode can be correlated in a qualitative manner with the structure of balancing loops with delays impacted upon by a continuing growth in population.

In particular one might be tempted to hypothesise that the pattern of capital expenditure is characterised by bouts of over and under capital spending with some hint that the amplitude of the oscillations is increasing with time!

Opponents of the current reforms tend to agree with this citing proposals, for example, for managing segments of the industry on the basis of a series of 3-year contracts as being conducive to underspending on both maintenance and new works. In addition the general upheaval of the industry and the effects of downsizing have led to a drop in the capacities of current authorities to spend their capital budgets.

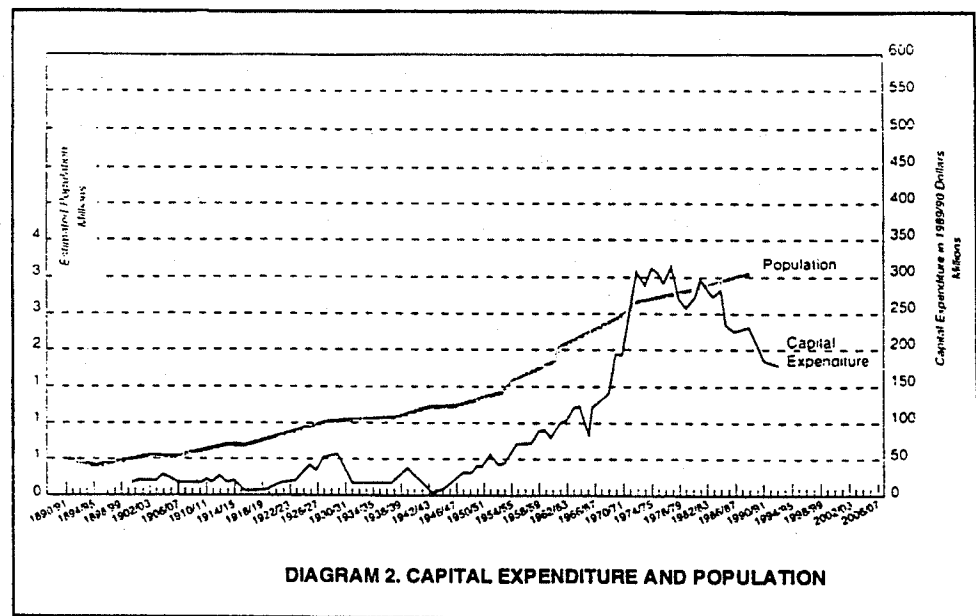


DIAGRAM 2. CAPITAL EXPENDITURE AND POPULATION

For the present, however, it is argued that, in the absence of fundamental changes in technology which would change the economies of scale underpinning the natural monopoly status of the industry, the characteristics of the system as captured in the causal diagram provides a more than useful framework within which to debate policy options. The picture is made even more complete if, for example, Porter's five-forces model (or its system dynamics equivalent) is used to emphasise the wider industry structure within which the restructuring debate should take place.

In using Diagram 1 as a framework for discussion, it is clear that the new industry arrangements do little to change the key underlying industry dynamics. Environmental crises and increases in community demands will continue to emerge from time to time, and they will be of such

dimensions that they will demand the coordination of significant forces to manage the implementation of solutions. An increasing fragmentation of the industry, with its attendant losses in economy's of scale, will increase the transaction costs of achieving the desired solutions in an effective manner.

Furthermore, the separation of planning and control from operating, which is central to the government's proposals, assumes that planners have at least as much information at their disposal as the operators. Over time this is a doubtful proposition. In addition, it creates a fundamental split in the processes by which organisations learn.

Note, however, that none of this implies that a monopoly operator, whether government owned or not, should be exempt from appropriate regulation with the efficiency of its operations measured against international, not local, benchmarks.

PART 3- INTRODUCING SYSTEMS THINKING.

The application of systems frameworks requires a mindset that is not all that prevalent in the debate about the future of the water industry in Victoria. What debate did occur, which was largely conducted behind closed doors with the report commissioned to study the structure not even being available to the authorities concerned let alone the wider public, seems to have been based on a rather static economic framework which has concentrated more on the allocation of water resources and weak forms of competition. It appears not to have encompassed issues such as the international nature of the industry, the relationship of the government sector of the industry to the private sector, the fact that the key business drivers have to do with environmental management and community learning, and the potential losses in scale economies.

Within Melbourne Water there was a growing body of understanding that to survive the restructuring challenge in tact there was a need to consider Melbourne Water's business as an open system. This was achieved over a period of some three years of integrating the corporate planning process with a program to educate senior and middle managers in contemporary approaches to corporate planning and strategic management.

A key starting point for this was to introduce the system dynamicists model of the strategic planning process which shows the feedback interaction of analysis, planning and control activities. This was made operational through the adoption of Ansoff 's model of strategic management (Ansoff and McDonnell, 1990) which in part emphasises the need to consider an enterprise as an open system in which you must align your capabilities to those required to survive and grow in the prevailing environment.

The recognition that Melbourne Water was operating in an environment characterised by level 4 to 5 turbulence- this relates to a scale of degrees of speed and complexity of change ranging from 1 to 5-. became quite widespread, particularly amongst middle management. Ansoff argues that such an environment requires the application of the principles of "strategic management"- a process which

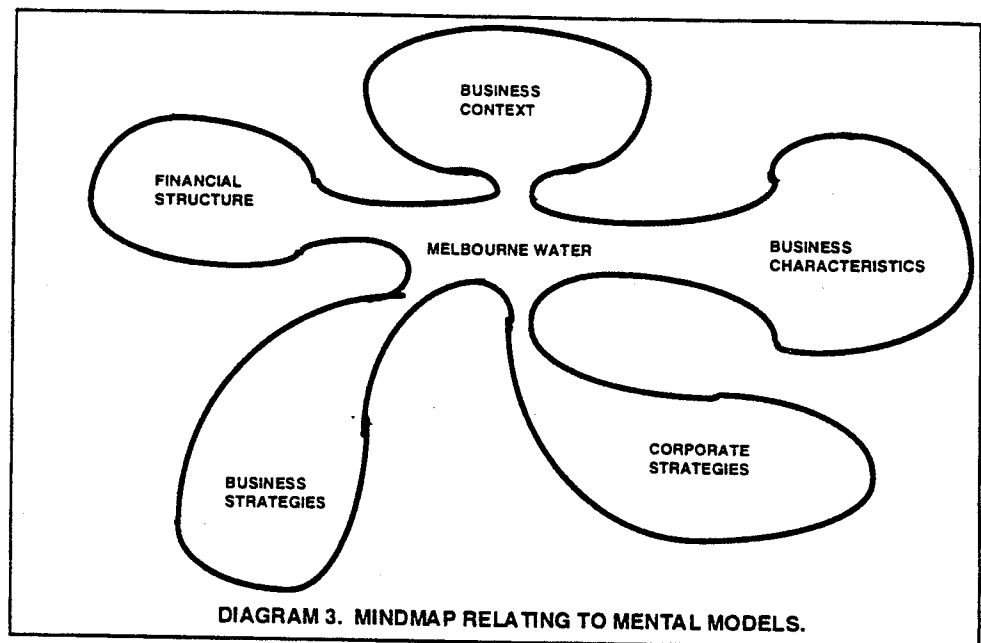
demands a great deal of environmental monitoring, tracking of "weak signals" and attempts to manage your environment through activities such as stakeholder management. Regrettably such ideas were not well accepted by some of the senior executive of the organisation, particularly those who eventually were directly engaged in the negotiations with the government and its consultants.

On reflection, it is apparent that the lack of consistent and holistic mental models of the business amongst some senior executives and a failure to learn from the past, was a major impediment to the achievement of the organisation's stated goal to retain itself as an integrated business, capable of competing at the world level, and using markets to achieve operational efficiencies by contracting-out appropriate elements of the business without compromising its core competencies.

This situation was exacerbated by most senior executives being trapped in what Argyris (1991) describes as "single loop learning" and not being able to move into "double loop learning".

Diagram 3 shows a simplified version of a mindmap representing the different components of the business as perceived in 1992. The business context includes issues such as the long-term capital investment requirements, the nature of the external business environment, and the organisation's capabilities. Business characteristics accounted for the nature of customers, the legislation governing the organisation's operations, the range of services, the economics of the industry, technologies and the organisation's core competencies. The financial structure and business strategy components are particularly related to meeting performance targets. It is my contention that while there was a strong representation of mental models surrounding the budget aspects of the financial sector and the business strategies, which are essentially operational issues, very few members of the executive had a deep appreciation of the relevance of the other sectors.

An accurate, shared mental model of the *complete* business is essential for real progress to be made in developing strategy and operating truly adaptive learning organisations.



CONCLUSIONS.

It is obvious that the management of public businesses and natural monopolies is one of those "chronic" problems to which systems thinkers can apply their skills. The Melbourne Water example demonstrates that it is possible to identify clear reference modes, particularly where there is a significant documentation of an organisation's history.

The prevailing economic frameworks, within which the restructuring debate has taken place, assumes a great deal of faith in being able to satisfy the preconditions required to guarantee the success of the resulting policies. Such approaches, clearly stress the "machine-age" thinking basis to contemporary economic theory. While the more "organic" approach to system thinking (and economics) is appealing, it is another matter to develop the appropriate frameworks and convince others that such an approach has merit.

For the water industry, pending the introduction major changes in technology, economies of scale are still the key drivers to improved performance.

A significant change in outlook amongst managers and policy makers is required. The acceptance of a need to articulate, test and debate prevailing mental models of businesses and industries is an essential starting point- a process which requires quite extraordinary patience, dialoguing and facilitation skills.

In the case of the restructuring of Melbourne Water the failure to adopt a sufficiently systemic view has led to decisions which are likely to prove counter-productive. This is not to deny the importance of the need to develop more effective regulatory processes for natural monopolies than price-capping and rate-of-return regulation, but it does support the Schumpeterian view that not all things about monopolies are bad. The need to stop using government businesses as instruments of fiscal and welfare policy as proposed in corporatisation models is of equal importance.

This paper, while being somewhat discursive, provides a background to a proposed more rigorous study in the spirit of Lyneis (1983) into regulatory processes.

It is part of a major new initiative at Monash University to research and teach systems thinking and to assist organisations to become learning organisations, to develop improved commercial strategies and deliver more effective public policies.

REFERENCES.

- Ansoff, I. and McDonnell, E. 1990. *Implementing Strategic Management. 2nd Ed.* Hertfordshire: Prentice Hall.
- Argyris, C. 1991. "Teaching Smart People How to Learn". *Harvard Business Review*, May-June, 1991.
- Barton, J. 1993 "harnessing Competition in the Provision of Electricity and Water Services- A Reply". *Issues in Competition Policy*. Canberra: Economic Planning Advisory Service, Australian Govt.
- Dingle, T. and Rasmussen, C. 1991. *Vital Connections*. Melbourne: McPhee Gribble.
- Lyneis, J. 1983. *Regulatory Policy and the Performance of Electricity Utilities: A System Dynamics Analysis*. Boston: Pugh Roberts Mimeo.