

The Dynamics of Garbage Collection: A System Dynamics Case Study on Privatization.

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This paper outlines a consulting assignment with a local city council in New Zealand. Local government in New Zealand, which represents the second tier beneath the central government, had been moving towards a competition based model for the provision of services that had previously been funded through taxes collected through local government. Participants in a Systems Thinking seminar identified the introduction of competition into a previously publicly funded service, a garbage collection, as an appropriate problem for analysis. The political imperative behind privatization in this council had been a reduction in rates (local taxes) and increased cost effectiveness through competition and user pays. The introduction of competition into the garbage collection system was chosen for analysis as it had not delivered the desired outcomes. A Causal Loop Diagram (CLD) exposed the underlying dynamics of the situation which arose from the initial goals of the authority namely, the introduction of the economic goal of greater efficiencies through competition and the social goal of a shift to recycling cross-subsidized from revenue from the garbage collection.

The story that the group told for this CLD was informative. As an introduction to competition the Council decided to begin charging a relatively low fee for garbage collection to ease the transition from what had traditionally been a “free” (ie funded out of local taxes) service. It was also decided to provide a “free” (cross-subsidised) recyclable collection to move residents towards recycling more of their garbage. Over time the price of garbage collection would be increased to increase the amount of recycling. Thus a fundamental dynamic of the model was a steady increase in the price the council charged to collect garbage. The council had assumed that the price that it set for collection would dictate the amount of recycling. It was also assumed that any private operator would match the council’s price. However, the competitor decided to leave entering the market until the council had raised its price to a point where the private operator could not only discount the council’s price, but also make a profit. Many residents stayed with the council as a matter of principle, while others opted for the less expensive private collector. Thus the “Price Gap” drove the relative market share of both collectors as shown in Figure 1.

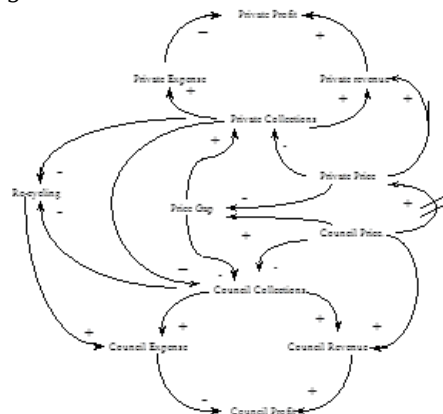


Fig 1: CLD of competitive garbage collection.

Two important policy implications emerge from the CLD. First, that while not being required to provide a recycling service, the private collector can set a price for garbage collection that dictates the total amount of recycling. The presence of a competitor in the market produced a counter-

intuitive outcome for the council: a lowering of the rate of recycling. Second, only the council is carrying the cost of recycling and this impacts on council expenses. The “behaviour over time” graphs generated by an “iThink” model demonstrated the dynamics of policies adopted by the council.

Figure 2 shows the point at which the private operator entered the market when the collection price is 70c per unit. Figure 3 shows the impact on revenue of the entry of the competitor: council revenue declines sharply and the revenue of both operators declines as the price increases.

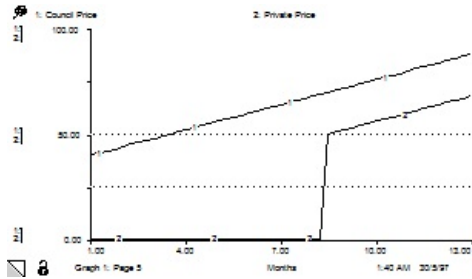


Fig 2: Price point for entry of competitor

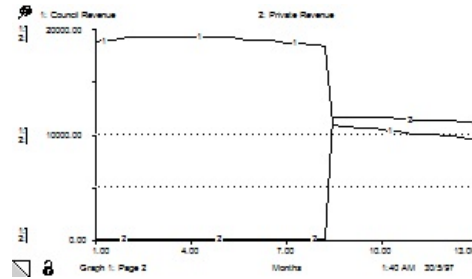


Fig 3 Relative revenue.

Figure 4 shows the relative profitability figures. The rising levels of recycling (shown in Figure 5), drives council expenses up and profitability down. The competitor, who does not cross subsidize the recycling is increasingly profitable.

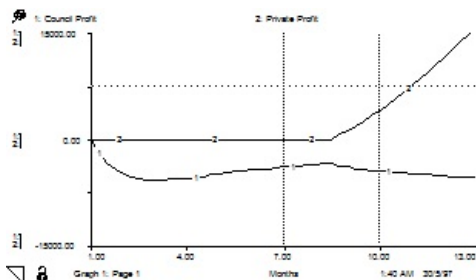


Fig 4: Relative profitability

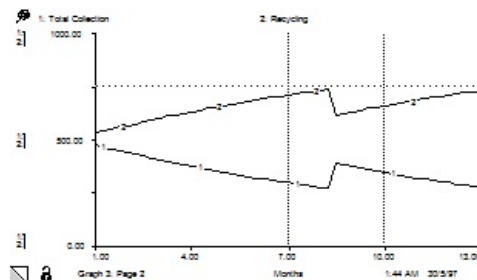
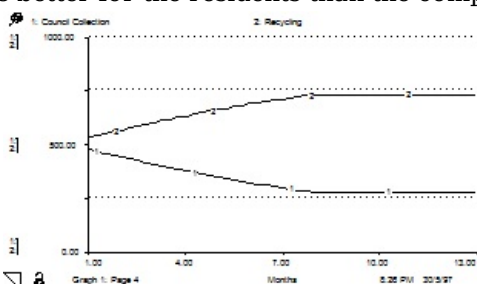
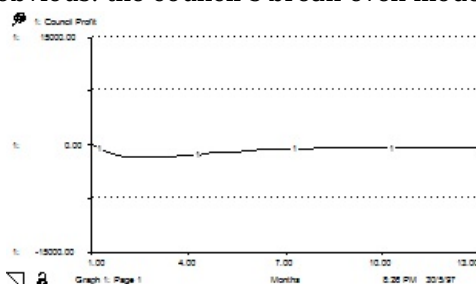


Fig 5: Mix of recycling and collection

The combination of the social policy on recycling with the economic policy on competition set up dynamics that led to a decline in the profitability of the council’s operation. The competitor took a significant proportion of the council’s market share through discounting and would only enter the market when it was profitable. In addition, the gradual shift to recycling eroded the council’s profitability. Finally, the social policy goals to be met through cross-subsidization, they create a disadvantage for the council.

The simulation can now be used to test policy options. The first is for the council to keep its price at a level where it is unprofitable for a competitor to enter (68c per unit). Figure 6 shows that the losses are greatly reduced while Figure 7 shows that the level of recycling is similar to that in Figure 4 without the dip caused by the entry of the lower priced competitor. If the recycling can generate a profit, the council may be able to break even or make a slight profit overall. This option also delivers a lower price to the resident (68c per unit) than the competitive model (88c per unit). The moral is obvious: the council’s break even model is better for the residents than the competitive model.



Graph 1: Page 1

Graph 1: Page 4

Fig 6: Council Profit - restricted price increase

Fig 7: New mix of recycling and collection

A number of other policy options emerged: transfer a share of the cost of recycling to the by forcing it to collect recyclable garbage; abandon the policy of free recyclable collection, impose some charge and be prepared to wait longer to optimize recycling; abandon the policy of privatization and continue to use local taxes to achieve socially desirable outcomes in garbage collection. Another set of dynamics was also discussed. The shire was predominantly suburban but included rural properties where the costs of collection were higher. The competitor was able to “skim” the more lucrative suburban market, with the council left with the obligation to maintain its service to the rural market. This cross subsidization exacerbated the problems of declining council profitability. While the council operation must maintain policies of recycling and servicing unprofitable rural areas, it was unable to compete on an equal basis.

The exercise proved to be a simple but clear demonstration of the counter-intuitive nature of policy. It was also a demonstration to the participants that a deep understanding of the dynamics of policy decisions cannot be made without the aid of systems thinking and system dynamics modelling.