THE PROBLEM OF LAPSED FUNDING AND THE KNEE-JERK "BETTER INFORMATION SYSTEM" SOLUTION: THE CASE OF THE DEPARTMENT OF NATIONAL DEFENCE IN CANADA

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ABSTRACT. In this paper, we argue that a better information system is unlikely to solve the problem of lapsed funding that characterizes many government departments. This result is shown to depend critically on the nature of government costs.

INTRODUCTION

The Department of National Defence (DND) in Canada has trouble expending all of the funds it is authorized to spend in a given fiscal year. This gives rise to lapsed funding (funding that is permanently lost to the department), an outcome that is viewed negatively at the highest levels of management. For example, reacting to DND's lapsed funding in excess of $300 million in fiscal 2008, the Auditor-General of Canada wrote this in her Spring 2009 Report: "The lack of accurate and timely information for decision makers contributed to the lapsing of more than $300 million in funding that was available during the 2007-08 fiscal year but is now permanently unavailable to National Defence" (Auditor General of Canada, 2009). The AG's suggestion is that a better information system would help to solve the problem.

In this paper, we take the position that there are limits to reductions in lapsed funding that a better information system can

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provide. We will argue that the best, most agile information system will not reduce lapsed funding to zero, even if it were a good idea to do so. The kernel of our argument is based on the structure and uncertainty of government expenditures and we detail it in section 3. Essentially we argue that the structure of costs is such that the government must make irrevocable investments in lower value activities before the uncertain costs of higher value activities are known with certainty. It is the simultaneous nature of these expenditure decisions in higher and lower value activities that gives rise to lapsed funding. Moreover, given this simultaneity, it is clear that an enhanced information system will not solve the problem.

THE RECORD OF DND LAPSED OPERATING FUNDING

DND has two kinds of funding: operating funding (Vote 1 funding) and capital funding (Vote 5 funding). Capital funds are those destined for investments in weapon systems and fixed infrastructure, investments that require expenditures over a series of years. Very often, DND does not expend all of its capital funding but traditionally this has had more to do with the vagaries of dealing with contractors rather than any specific action that DND has or has not taken. Capital assets are usually purchased under contracts which specify payment schedules that are dependent on specific milestones that a contractor must meet. When a contractor, for whatever reason, cannot deliver a particular milestone in the fiscal year the contract calls for it, the work and payment "slip" to the next fiscal year.

Operating funding, on the other hand, is funding that covers the primary day-to-day activities of the department. We could classify defence activities into three broad classes:

- *Force Application* activities (the ongoing military operations the department is involved in);

- *Force Generation* activities (training the future force); and

- *Other* activities (such as the transport of public officials).

Of these, the most important are the first two. The raison d'etre for defence is the application of force as required. And it is impossible to apply force without first putting it in place.

We present the total authorities, actual spending, and lapsed funding for the Department of National Defence (DND) operating

budget for the period 2002-2010 in Table 1. In two of the last three years, the lapsed operating funding has exceeded $400 million. But these amounts do not represent permanent lapsed funding. For example, take the lapsed funding in 2009-10. An inspection of the DND Performance Report for 2010 reveals that, taking into account various carryover provisions, only $123.4 million of the lapsed funding became permanently unavailable to the Department. The same check for 2008-09 suggests that only $31.9 million was permanently lost. In this sense, the lapsed funding reported in the Public Accounts is an upper bound on permanent lapsed funding.

Over the last two years, permanent lapsed operating funding has averaged 1/2 of 1% of authorized operating funding. Over the eight years of data we have, the Lapsed Funding as a percentage of Total Authorities is about 1.6% and, as argued above, this exceeds the percentage of permanent lapsed funds.

In sum, DND lapses significant dollar amounts of funding. The question is whether an improved DND information system would lower these amounts.

TABLE 1
Vote 1 Lapsed Funding over the Period 2002-2010 (all values in thousands of dollars)

Year	Total Authorities	Actual Spending	Lapsed Funding
2009-10	15,204,236	14,792,353	411,883
2008-09	14,381,794	14,283,787	98,007
2007-08	13,234,228	12,812,313	421,915
2006-07	12,014,953	11,925,234	89,719
2005-06	11,107,947	11,093,092	14,855
2004-05	10,669,994	10,474,202	195,792
2003-04	10,120,800	9,867,900	252,900
2002-03	9,394,600	9,319,700	74,900

A SIMPLE MODEL

To undertake its mission in a particular fiscal year, let us suppose a defence department must allocate operating funding to two activities: a Core activity and a set of Non-Core activities. The department has no choice with the Core activity; it must be completed

subject to one relaxation we mention below. On the other hand, the Non-Core activities are discretionary; if there are funds available, some of them should be undertaken since they add value to the organization.

The cost of the Core activity is uncertain. For example, suppose it is uniformly distributed in the interval [70,100] expressed in monetary units and this cost will not be known exactly until the Core activity has been completed. The decision-maker has a budget of 100 to ensure that the Core activity can be completed under the worst case. Thus, he/she will be able to spend anywhere from 0 to 30 monetary units on Non-Core activities depending on the cost of the Core activity.

If it were possible to do Core and Non-Core activities sequentially, the decision would be straightforward. The department could first undertake the Core activity and see how much it cost. If that cost were, say 75, the department could then spend 25 on Non-Core activities to make sure that the complete budget was expended. But, as we will argue below, it is just not feasible and/or desirable to do defence activities sequentially. For this reason, let us suppose that a decision must be made on the amount to expend on Non-Core activities before the cost of the Core activity is known with certainty.

There is one more model complication to discuss. If the sum of the cost of the Core and Non-Core activities turns out to exceed 100, the department must take a so-called "off-ramp" to stay within budget. In this case it will have to reduce the Core activity by some amount up to the spending that exceeds 100. That is, we may realistically expect some combination of Core and Non-Core activities will be shut down, and the value lost per unit of off-ramp spending will certainly exceed the value per unit of Non-Core activities originally added. For purposes of illustration, suppose the value lost per unit off-ramp is 3, while the value per unit of Non-Core activity added is 1.

The key question, then, concerns the level of Non-Core spending the department should undertake. One alternative would be to set the Non-Core spending at 0. In this case there is no chance of off-ramping and the value gained from Non-Core activities is 0.

Another alternative would be to spend 30 on Non-Core activities. In this case there would be 0 lapsed funds but the average off-ramping would be 15. The net value gained from this decision would

be on average 30×1 - 15×3 = -15. This is not a good solution if one were trying to maximize the expected increase in value from the inclusion of Non-Core activities.

In fact, if the department does choose to maximize the expected value of Non-Core spending, we have shown elsewhere (see Brimberg and Hurley (2012)) that, for the data of this example, it is best to spend 10 on the Non-Core activities. The net gain in value on average for this decision is: 10×1 - 5×3×1/3 = 5.

Lapsed funds will occur 2/3 of the time, while off-ramping will occur the remaining 1/3 of the time. This result generalizes over a wide range of assumptions about activities and uncertainty. More generally we have these results:

Result 1

In the case where a department is trying to maximize the expected value added from Non-Core spending and Non-Core spending must be committed before Core costs are known with certainty, there is a positive probability of lapsed funding.

Hence, when departmental decision-makers are doing their jobs properly, we would expect to see lapsed funding some of the time. What is more important is the usefulness of information systems in this context.

Result 2

In the case where a department is trying to maximize the expected value added of Non-Core spending and Non-Core spending must be committed before the Core costs are known with certainty, there is no information system that will reduce lapsed funding to zero.

It should be clear from the context of the model that, since commitments to Non-Core spending must be made before Core costs are known with certainty, there is no information system that could ever solve the problem of lapsed funding.

There are a couple of important points to make about this simple model. Clearly, a good information system will narrow the uncertainty in the Core activity cost as the year progresses. But it will not eliminate this uncertainty. Furthermore, it is often the case that good Non-Core activities have a limited window of opportunity and this

window may close early in the fiscal year. By way of example, suppose the Army would like to run a specialized training course to get a number of Non-Commissioned Officers (NCOs) promoted. In their planning, they have specified that this course is not essential but that they would like to offer it if there are sufficient funds available. Additionally, given the availability of instructors, this course can only be offered over the summer. This is very early in the fiscal year which, for the Canadian government, runs from April 1 to March 31. In this case, the decision on this course would have to be made early in the fiscal year, well before the actual Core cost is known with certainty.

The second point relates to a less aggregate model of the DND organization. Elsewhere (Brimberg & Hurley, 2012), we have conceptualized DND as not a single actor trying to decide which Non-Core activities to undertake but rather as a set of decision-making units each with a budget. As the year progresses these units are assumed to exchange information on the costs of their Core and Non-Core activities and, as the end of the year approaches, those units with funding surpluses are assumed to pass funding to those who wish to off-ramp. In this case, there is less lapsed funding on average for the organization as a whole but nonetheless there is lapsed funding.   Furthermore, the problem we argued in the previous paragraph does not go away for individual units.

In the next section, we put some meat on the bones of our concept of cost structure and its role in neutralizing the effects of an improved information system.

THE IDEA OF A NEWSVENDOR COST STRUCTURE

We conceive the planning hierarchy in a government department such as DND as a collection of semi-autonomous decision-makers. Each is given an operating budget for its unit and each allocates this budget to a set of activities. Furthermore, these activities have four important characteristics:

- *Differential Value*. Some activities have higher values than others. For instance, a military or humanitarian aid operation would typically have a higher value than, say, the transport of public officials or an upgrade of office equipment. In reality we conceive that there is a rank-order of importance in the activities. We

differentiate two kinds of activities, Core activities and Non-Core activities, and we define them as above: Core activities are the most valuable activities and activities that must be done; Non-Core activities are non-essential activities and not as important.

- *Uncertain Cost*. For some Core and Non-Core activities, it is not possible to determine the actual cost at the time the decision is made to undertake the activity. For most activities, an actual cost will only be known after the activity has been completed.

- *Non-Sequential Execution*. It would be nice if the activities could be performed sequentially in order of their value. As each activity was completed, a decision-maker would know how much the completed activities had cost and therefore what was left to spend on the remaining activities. But of course, as argued above, this is not possible. Activities that add value to the organization must be done concurrently for a variety of good reasons. Thus, we assume there is considerable time overlap in the execution of the activities, and a decision-maker must make commitments to some lower-value activities before he/she knows what some higher-value activities will actually cost.

- *"Off-Ramping."* Towards the end of the year, if it becomes clear that a unit is going to overspend its budget, it may have to cut one or more on-going Core activities in order to reduce expenditures so that they are within budget.

These four factors in combination give rise to what we term a Newsvendor Cost Structure or NV Cost Structure.

DEFINITION

Suppose a government unit has a set of Core activities that must be executed in the upcoming fiscal year and a set of Non-Core activities that are optional. Without loss in generality, we assume that the budget is just sufficient to cover the Core activity expenditures in the worst case. The unit is said to have an NV Cost Structure if an irrevocable decision to go ahead with any Non-Core activities must be made before the cost of the Core activities is known with certainty.

Thus, the financial planner is faced with a dilemma. If only the Core activities are implemented, there is a positive probability the budget will be underspent and lapsed funds will occur. Meanwhile, by

adding Non-Core activities, there is a positive probability the budget will be overspent and off-ramping will be required.

We term this structure of costs a Newsvendor Cost Structure because of its similarity with the cost structure of the classical newsvendor problem. In that case, a newsvendor must decide how many papers to stock each day before knowing what the demand will be. On some days, demand will be unusually low and he will have stock leftover; on other days, he will have too few newspapers and some customers will be disappointed. In the same way, our government decision makers must make funding commitments on Non-Core activities before it is known whether there will be enough demand for Non-Core dollars. The interested reader is referred to Khouja (1999) for a review of the newsvendor problem literature.

CONCLUSIONS

In this paper we have presented an argument which suggests that an improved information system is not a complete solution for the lapsed funding problem in most government departments. This problem arises because most governments require their departments to "hand in" all unused funds at the end of the fiscal year.

We argue essentially that cost uncertainty and the simultaneous nature of activity cost decisions lead to a Newsvendor Cost Structure and with this structure it is impossible for a better information system to make the problem go away.

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