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Preparing transitions in public services: Payoff dimension, value estimation, schedule and budget computation

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ABSTRACT

We assess how much a public service transition project is worth. Previously, as suggested by the World Bank, an entire economy model was required to value any single public project. Our approach consists of finding an appropriate transition invariant payoff dimension for the public service being provided and use it to find the optimal level of service before and after the transition takes place. The preceding results and the current budget allow us to obtain bounds on the value of the transition. Total time to complete the task may be as low as two months. The methodology is presented and explained based on its application to the transition from inquisitive to accusatory processes in the justice procurement service in a developing country.

1. Introduction

Public sector capital project investments constitute an important fraction of total government expenditures. In developing countries, Devarjan et al. [5] estimate public investments per year at approximately 4% of their Gross Domestic Product, but that figure merely constitutes a lower bound on total public sector project expenditures. However, a recent United Kingdom government sponsored study (Winter et al. [21]) revealed that, beyond output specifications, determining the overall value/benefit to be derived from a public sector project is still a major unsolved issue. Of particular relevance are what have been termed transition projects in public services (Geels and Kemp [8] and Geels & Schot [9]). Such transitions typically have a legal mandate, require exceptional funding and constitute improved service responses to a more demanding globally informed society.

Our contribution consists of a methodology designed to determine the overall benefit to be derived from a public service transition project. We provide the value of the project in a simpler, faster and easier to interpret way than the traditional public sector project evaluation approach developed by the World Bank. We summarize our methodology in three steps: 1) Determining the service's payoff dimension, 2) Use it to estimate the value of the transition, and 3) Provide an acceptable service disruption transition schedule with the budget required to implement it. The methodology is a result of our involvement, at the request of the Mexican Attorney General, in their transition from inquisitive to accusatory processes. We provide our findings in that case to serve as an example.

The traditional economic public sector project evaluation approach, as presented by Squire and van der Tak [15] and Little and Mirrless [10], ties all projects to the World Bank economic objectives of contributing either to growth or to improve the distribution of national income and argue in favor of using shadow prices in both potential benefits and costs. Because shadow prices depend on the relative scarcity of the resource, they may bear no direct relation to the actual market observed prices, and to evaluate any single project one has to solve a complex nationwide model. The use of this approach has been, according to some of its initial proponents (see for example Little and Mirrless [11], or Devarjan et al. [5]), almost completely abandoned. We believe that our methodology successfully addresses the shortcomings of previous complex economic approaches by addressing each public service transition on its own, as a service being potentially improved. This approach not only permits a deeper understanding of the rational for the improvements sought, but also enables setting stand alone measurable benchmarks as well as performance standards. In order to facilitate the analysis we consider each public service to be connected to the other public services only through the budget that has been assigned for its provision. Nonetheless, we still face the challenge: How do we measure the impact from a public service

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transition in a meaningful way?

In search for an answer we looked at the approach taken by the private sector. Beginning with Gaddis [6] who originally introduced the objective of managing a project as "the attainment of a goal … on time, within budget and with predetermined performance specifications", decisions regarding trade offs in those three variables (output specifications, time to completion and budget) can be traced back to its potential impact on the overall project's net present value (NPV). Therefore NPV can be regarded as the relevant ultimate private sector payoff dimension. But in the public sector, NPV is not a relevant payoff. In the public sector the benefits associated to a service transition are frequently expressed qualitatively, or references may be made to some partially representative outputs. However, there usually does not exist a measure that captures the benefit derived from the service as a whole. Consequently, there is no integral cost/benefit analysis to serve as a basis to request an adequate transition budget. Once a proper measure or payoff dimension has been chosen, it will influence all subsequent project management decisions and will facilitate the identification of the critical issues to project success, allowing transition project managers to focus on them (Asrilhant et al. [1]).

In order to address the project management challenges, we begin by adopting the typology introduced by Pich et al. [12], designed to assist project managers in choosing the appropriate management approach depending on the complexity and ambiguity associated to their challenge. Because technologies are normally adopted by the public sector services after they have been tested in the private sector, and new service systems are usually first tried on a small scale before adopting a new service paradigm, we would expect most of the transition projects for services offered by the public sector to be classified as having *adequate* information about possible states of the world. Therefore, we decided to adopt an *instructionist* approach, as opposed to the learning and selectionism strategies described by Sommer and Loch [13] in the presence of "unforeseeable uncertainty". The instructionist approach recommends the traditional operational research task and schedule tools to manage a project.

Following Pich et al. [12], in order to address project management decisions, we define a preference function $\Pi(\omega',A)$ mapping an end state of the world ω' and activities $A\in\mathscr{A}$ to a project payoff. Here A consists of one possible set of activities satisfying all scheduling precedence constraints to achieve the transition, and $\mathscr{A}$ consists of all such possible sets of activities. The ending state is itself a result of the initial state ω (which contains all factors that might influence the final state) and the chosen activities. Using their notation $\omega' = M(\omega,A)$, but usually we may only have an approximation $\widehat{M}(\omega,A)$, due to the complexity and unawareness of all factor interactions in M. Therefore, both the ending state and $\Pi(\widehat{M}(\omega,A),A)$ are random variables. A set of activities A is chosen to maximize the expected payoff under $\widehat{M}$. Our initial objective is to identify a proper payoff transition invariant dimension $P=\Pi(\widehat{M}(\omega,A),A)$ and then use it in an *instructionist* approach to find the optimal service provision both under the current system and the expected level to be obtained from the new one. In order to successfully implement the methodology, the researchers must have access to all relevant information; however, the level of detail with which the information is analyzed is limited by the date set to deliver the project report.

Conceptually, a public service consists of a set of activities designed to benefit its user over a period. The tasks are specified by the service's management team, within a framework determined by local laws and are performed in culturally influenced, inertia weighted ways. A *transition* to a new service paradigm implies a new way of performing possibly different activities, where even the laws governing its provision may change. Therefore, transitions will require a training program, for the service providers, designed to cause minimal disruptions. Our methodology ends by addressing how to schedule the transition to the new system by managing the disruption in the service provision and addressing the trade offs involved.

The remainder of the paper is organized as follows: Section 2 presents the methodology and explains its major steps. Sections 3–5 presents the methodology as it was applied in the transition from inquisitive to accusatory processes in Mexico. Section 3 introduces the first two steps. Section 4 develops the valuation model in three stages: i) Maps the output capacity per service provider to the payoff dimension. ii) Constructs the optimization model for the current system and iii) Constructs the optimization model for the new system. Section 5 analyzes the results of the model presented in the preceding section. Section 6 addresses issues involved in scheduling the transition. Section 7 ends with the conclusions.

2. Methodology

Our proposed methodology consists of the following steps, each of which will be described in detail in the subsections that follow.

Public service transition methodology:

I Understand the purpose of the service being provided: Service's attributes, decision variables and major independent variables.

II Identify an appropriate payoff dimension possessing the following attributes (go back to **I**, as needed, until all five attributes are satisfied):
1. Meaningful under the original and new service paradigms:
   i Make sure all outputs in **I** are easily transformed into the payoff dimension,
2. The information needed to compute the measure must be obtainable,
3. A higher value must clearly reflect improved performance,
4. Incorporating the measure into a model should be easy and meaningful,
5. A unit has the same meaning throughout the scale in terms of improved performance and a total absence of service performance is assigned a zero.

III Find the preference relation mapping space attributes, decision and independent variables to the payoff dimension for the current system and the new one.
1. Determine the service output: capacity per service provider unit. Use regression analysis, or general functional parameter estimation to determine the service capacity per server unit.
   i. Choose appropriate parametric approximation. Keep it as simple as possible to fulfill attribute *II.4* in the payoff dimension. Clearly establish general assumptions of the model (i.e. linearity, independence of error terms)
   ii. Use statistical tests to validate representativity and usefulness of each parameter (i.e. choose unbiased estimators, compute the estimator's variance, use *t* tests to validate its role in the model).
   iii. Assess statistical validity of the model (i.e. adequate goodness of fit – acceptable level of