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Applying operations management logic and tools to save lives: A case study of the world health organization's global drug facility☆

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Abstract

In the field of operations management, theory concerning lead-time reduction is well developed. The application of lead-time reduction theory to the not-for-profit operations context, however, has been limited. We present an illustrative case study of a not-for-profit operation in which long lead times cause a substantial increase in unnecessary deaths from tuberculosis and hinder the efforts of the World Health Organization to eradicate tuberculosis globally. The case study suggests that lead-time reduction theory may be as effective in not-for-profit (service) operations as it has been in manufacturing operations. Our results also illustrate how use of sophisticated but ''user-friendly'' queuing theory-based modeling tools can facilitate the acceptance and transfer of operations logic to a not-for-profit intergovernmental organization setting.

Keywords: Tuberculosis; Operations management; Lead-time reduction

1. Introduction

The purpose of this case study is to provide a brief illustrative example of the benefits of transferring operations management logic and tools to a not-for-profit intergovernmental organization, the Global Drug Facility (GDF) of the World Health Organization. As such, it is intended neither to provide a comprehensive literature review of queuing theory applications in not-for-profit organizations nor to extend theory concerning mathematical modeling of such operations. Rather, it provides an overview of how equipping doctors and international civil servants with basic principles of operations management and then training them to build simple queuing theory-based models of their

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process yielded lead-time reduction results that could save lives. In addition to demonstrating the clear-cut applicability of a queuing model to an intergovernmental organization, the more important contribution of this case study may well be to illustrate the benefits of combining the transfer of straightforward operations management approaches with simple modeling as a means for achieving buy-in and implementation in the not-for-profit context, where managers are not accustomed to thinking of themselves as running operations, and where the emphasis on efficiency and cost reduction makes lead-time reduction even more difficult than in the competitive arena faced by for-profit organizations.

The paper is organized as follows: Section 2 provides some brief background concerning TB and the problems caused by long lead times in the intergovernmental operations working toward the control and eradication of TB. In Section 3, we present our basic process analysis of the GDF application processing operations, followed by a discussion of the queuing theory-based model developed by the team. Results are presented in Section 4. In Section 5 we suggest implications of the study for both the WHO and not-for-profit organizations.

2. A life-saving need for lead-time reduction

It is now commonly agreed that TB control and eventual elimination have shifted from being technical problems to being managerial and political challenges. The tragedy of TB is that almost 2,000,000 people die annually (i.e., one person every 15 s) of a disease that can usually be cured in 6 months with $10 worth of anti-tuberculosis drugs (ATDs, Stop TB website, 2003).

Several decades ago, controlling TB was a top priority worldwide. The discovery of effective ATDs led to a substantial reduction in TB in most developed countries; hence, TB control became a relatively low priority. The same decline in TB cases did not occur in less-developed countries, however: By the late 1980s, it became clear that TB was an urgent problem, especially when combined with the problems of interaction with HIV infection and increasing outbreaks of multiple-drug-resistant strains of TB. Today, 8.5 million people develop TB every year, with 80% of these cases occurring in 22 ''high burden'' countries (WHO, 2003). The WHO and other partner organizations responded to this crisis by forming the Stop TB Partnership to mount a global attack on TB, setting global targets of detecting 70% of people with infectious TB and curing 85% of those detected by the year 2005 (Raviglione and Pio, 2002).

The internationally recommended primary strategy for controlling TB is known as DOTS (which originally stood for ''directly observed treatment, short course''). Between 1990 and 2001, the number of countries that had an appropriate system for tuberculosis control rose from less than 10 to 155 (WHO, 2003) due to implementation of the DOTS strategy. It is generally agreed that the DOTS strategy is the most effective strategy for controlling TB. The World Bank referred to DOTS as ''one of the most cost effective strategies available'' (Stop TB website, 2003). Dr. Gro Harlem Brundtland, then Director-General of the WHO, referred to DOTS: ''We have a cure. We need to mobilize the world to use it'' (Stop TB website, 2003).

In spite of the effectiveness of the DOTS strategy, however, the WHO estimated that in 2000, only 27% of new cases were identified, implying that global targets for TB control would not be reached until the year 2013 at the earliest (WHO, 2002). The major challenge in controlling TB is to ensure that patients take their medication daily during the 6 months required for treatment. Efforts to ensure compliance with treatment have been hindered, however, by lack of access to low cost ATDs of consistent quality. For this reason, the Stop TB partners formed the GDF in early 2001 to fund and manage procurement and quality assurance for countries applying for assistance.

The vision of the GDF is a TB-free world. Its mission is to: (a) ensure uninterrupted access to quality TB drugs for DOTS implementation; (b) catalyze rapid DOTS expansion in order to achieve global TB targets; (c) stimulate political and popular support in countries worldwide for public funding of TB drug supplies; and (d) secure sustainable global TB control and eventual elimination (Global Drug Facility website, 2003).

The GDF began their work with the objective that lead times from arrival of an application to delivery of drugs to the port of the applying country would be less than 6 months (i.e., 132 working days); lead times