Journal of Operations Management 53–56 (2017) 9–22

Contents lists available at ScienceDirect

Journal of Operations Management

journal homepage: www.elsevier.com/locate/jom

Improving home care: Knowledge creation through engagement and design

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ARTICLE INFO

Accepted by: Dr. V. Daniel R. Guide

Keywords:
Design science
Problem solving
Practical problems
Health care
Home care
Theory of Constraints

ABSTRACT

In this paper, we apply a design science approach to help a Northern European city improve the efficiency of its home care delivery system. Our proposed solution emerges as a synthesis of applying Goldratt's Theory of Constraints and the principles of variable-demand inventory replenishment. The improved system exhibits both more level resource utilization and higher productivity due to more efficient capacity utilization. In addition to improving system efficiency, we gain insights into how authentic operations management problems can be addressed through design research. A crucial aspect of empirically-rooted practical problems is that they always involve multiple stakeholders with only partially overlapping preferences. Consequently, one must not assume or ascribe an *a priori* system objective, instead, it must arise from explicit empirical analysis of the relevant stakeholders. Another characteristic of authentic problems is that they are always embedded in an institutional context that sets significant boundary conditions to the feasibility of solutions. These boundary conditions are an important reminder of the complexity of empirically-rooted managerial problems.

1. Introduction

If Mrs. Johnson has to move into an assisted-living facility because she needs help with her daily insulin injections, everybody loses. As we get older, living in our own homes as long as possible is not only a matter of personal preference, it is also more cost effective for cities and states to develop systems and infrastructure to promote assisted home living. If successful, such promotion lowers the unnecessary influx of senior citizens into assisted-living facilities and the health care system more generally. With this general objective in mind, the city of *Espoo*, the largest suburb of Helsinki, Finland, reached out to us for help in designing and improving a city-wide home care system. The pressing problem stemmed from baby boomers reaching the age where they required assistance in increasingly larger numbers, yet, the resources allocated to home care had not increased proportionately. The system would need to be more efficient to ensure the requisite quality of care.

The key questions regarding the design of the home care system fall squarely in the domain of operations management (OM) research (e.g., Eveborn et al., 2006; Eveborn et al., 2009): How should the daily travel routes of nurses be planned? How should overall caregiver capacity allocation be planned? These are the questions we were asked to address. Our task was to help build, evaluate, and, if needed, redesign *a home care delivery system*.

The extant literature on the topic is commendable as it has led to many improvements of the home care system particularly in the Scandinavian countries (Eveborn et al., 2009) and the *Benelux* countries of Belgium, the Netherlands, and Luxembourg (Duque et al., 2015). Of course, the problem is not limited to these countries, as scholars in the United States have observed similar challenges in the organization and coordination of home care (e.g., Osborn et al., 2014). We seek to complement this research by focusing on the problem in the authentic field setting. This is important, because a common denominator in much of the research literature on home care is that the problem and the objective are taken as given:

> "When viewing the daily planning as a scheduling problem, the objective is to create a schedule that allocates visits to staff members. The efficiency of the plan is judged by the amount of travel time it requires and how well it has succeeded in allocating all visits to staff members. The quality is judged by how well continuity is kept with staff member visits to each client." (Eveborn et al., 2006: 964).

The premise embraced in this passage is echoed in much of the literature on home care systems. The underpinning assumption is that the nature of the problem and the objectives are *a priori* known (Begur et al., 1997; Duque et al., 2015; Yuan et al., 2015). But how problems

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https://doi.org/10.1016/j.jom.2017.11.001
Received 8 November 2015; Received in revised form 31 August 2017; Accepted 9 November 2017
Available online 21 November 2017

become framed and which objectives become important is an essential part of any problem-solving process (Mingers, 2011; Mingers and Brocklesby, 1997; Simon, 1997). To declare travel time and continuity as the key objectives of the home care system is straightforward but lacks empirical rigor. To clarify, this is not to say that these are the wrong objectives, the point is that objectives, whatever they may be, must be established through explicit analysis, not by assumption or declaration. Authentic field problems tend to involve several stakeholders whose objectives and preferences are only partially overlapping. Our stakeholder approach parallels the approach taken by Freeman et al. (2010: 24):

> "Business can be understood as a set of relationships among groups which have a stake [hence, *stake*holder] in the activities that make up the business. Business is about how customers, suppliers, employees, financiers (stockholders, bondholders, banks, etc.), communities, and managers interact and create value. To understand a business is to know how these relationships work."

This stakeholder approach is appreciably similar to the approach taken in recent OM literature on sustainability, for example (Gualandris et al., 2015; Sarkis et al., 2010).

In a home care setting, considering stakeholder issues is crucial, because only by sheer miracle would the aspirations and the objectives of the diverse stakeholder groups—customers, caregivers, management, and the service provider—readily align (e.g., Cyert and March, 1992). To be sure, Mrs. Johnson certainly has preferences that would be at least partly in conflict with economic efficiency considerations. More generally, tensions between quality and efficiency in health care systems are well known and documented (Payne, 2006). In the home care context, an effective solution must be based on an understanding of these tensions. To ascribe *a priori* an unambiguous common set of objectives is to ignore these realities (Davies et al., 2005).

This paper has two aims. The main objective is squarely practical: to help the practitioner design a more effective home care system and to demonstrate that this design improves system performance. This involves an attempt to find solutions to resource allocation and efficiency problems that had proven very difficult prior to our involvement. The secondary objective is academic: to understand the important role that problem framing plays in how academics approach practical problems. Specifically, our aim is to unearth some of the underlying assumptions we tend to take as given. Of course, the idea that problem framing is fundamentally conditioned by our knowledge of the available solutions is not new (Cohen et al., 1972; Gigerenzer, 1991; Sarasvathy, 2001). However, we are able to explicate and elaborate what this means in a specific empirical setting. In particular, we show how in an authentic practical setting the attempt at a solution changes how the problem is framed. In addition to tackling the practical problem and seeking solutions, we also want to understand the dynamics of problem framing and solutions in an authentic setting. This in turn could lead to a better understanding of design science research in OM (cf. Holmström et al., 2009; van Aken et al., 2016).

The starting point of our research effort is that the practitioner's problem does not exist "out there", but rather, emerges as the result of a complex, iterative process of *framing* and *design* where the researcher plays a crucial part (Simon, 1997). Consequently, as part of our research effort we apply various tools that help us understand framing in particular. These tools take into account that in managerial practice, problems and solutions do not have a well-defined linear relationship in time. To use Corbett and Van Wassenhove's (1993: 626) terminology, solving a real-life problem is primarily a *management engineering* effort, which focuses on the engineering of a solution as opposed to mere application of existing solutions to *ex ante* identifiable, well-defined problems, where problem definition unambiguously precedes the attempts to solve it. The home care problem we faced was *ill-defined* (Simon, 1973) and *wicked* (Churchman, 1967). The latter is described as a "class of social system problems which are ill-formulated, where the information is confusing, where there are many clients and decision makers with conflicting values, and where the ramifications in the whole system are thoroughly confusing" (Churchman, 1967: B141).

The paper is organized as follows. We first discuss how the city first perceived and framed the problem, how we got involved, and how we approached the problem. After describing the data collection, problem framing and solution design efforts, we present the key results and limitations. To conclude, we turn to a more reflexive examination of the academic's role in solving practical problems.

2. Research context

The practical problem addressed is the organization of home care in Espoo, a city of 250,000 people in the Metropolitan Helsinki area in Finland. The initiative in question, *Espoo Home Care (EHC)*, provides a range of medical (health care and hospice), daily routine (e.g., bathing, grocery shopping), and social (e.g., transportation) services to senior citizens. Those providing the actual care—the visiting caregivers—are health care professionals, typically either registered nurses or licensed practicing nurses. Caregivers travel daily from home to home, applying their diverse skills to deliver whatever care the customer might need. EHC is largely a publicly funded effort, with 90 percent taxpayer contribution. The remaining 10 percent comes from income-adjusted copayments from those who use the service, which we label *customers*.

EHC was established in 2006 as a result of the merger of five separate but geographically collocated units. At the time of our involvement, EHC consisted of two major districts with nine caregiver teams of 12–26 caregivers in each district, a total of a few hundred caregivers. At the inception of our involvement, the system was decentralized in that caregiver teams operated more or less independently. This resulted in heterogeneous operational practices and resource allocation principles across teams. Much of the action was at the team level.

EHC is operationally complex for three reasons (cf. Eveborn et al., 2006). First, care is given in the field, delivered at people's homes instead of a centralized location. Second, individual customer needs are highly variable: one customer might need assistance with personal hygiene and administration of non-time-critical daily medication; another might need help every day just to get in and out of bed and time-critical medication such as insulin shots or pain relief. Sometimes the customer is for all practical purposes also a patient, but at the same time, medical care is only one of the services provided—*customer* is a better general label. Customer is also a better label, because in the focal context, the concept of home care encompasses not only health care but also other services such as social support. Third, demand for services is like demand for taxis, that is, peaks during certain times of the day and idle capacity during others. Caregivers can work in shifts, such that more capacity can be allocated to shifts with higher overall demand. At the same time, capacity is for all practical purposes a fixed cost, because in the focal context, caregivers are salaried employees whose salaries constitute roughly 85 percent of the total system cost. Use of temporary workers is possible but in practice prohibitively expensive. The quality of care provided by temporary workers is also generally considered to be of lower quality, not because temporary workers do not have the requisite skills but because using them disrupts continuity of care. The operational challenge thus arises from complex logistics combined with management of diverse and temporally fluctuating day-to-day customer needs in a high fixed-cost environment.

2.1. What, exactly, is the problem? understanding framing

In his classic book *Administrative Behavior*, Simon (1997: 126, emphasis added) discussed the perceived supremacy of Japanese manufacturers in the 1970s and 1980s:

> "[Was] the problem one of quality control, of manufacturing efficiency, of managerial style, of worker motivation, of wage levels, of