



Innovative Applications of O.R.

Integrating soft and hard operational research to improve surgical centre management at a university hospital



Leonardo Antonio Monteiro Pessôa^{a,*}, Marcos Pereira Estellita Lins^b,
Angela Cristina Moreira da Silva^b, Roberto Fiszman^c

^a Centro de Análises de Sistemas Navais (CASNAV), Praça Barão de Ladário, s/n° – Ilha das Cobras Rua da Ponte, Ed. n° 23 do AMRJ, Centro – Rio de Janeiro, RJ, CEP 20091-000, Brazil

^b Federal University of Rio de Janeiro, Centro de Tecnologia Bloco F Sala 105, Cidade Universitária, Ilha do Fundão, Rio de Janeiro, RJ, CEP 21945-970, Brazil

^c Hospital Universitário Clementino Fraga Filho, Rua Rodolpho Rocco 255, sala 5a26, Ilha do Fundão, Rio de Janeiro, RJ, CEP 22000-000, Brazil

ARTICLE INFO

Article history:

Received 22 May 2014

Accepted 6 April 2015

Available online 11 April 2015

Keywords:

Problem structuring

OR in health care

Simulation

ABSTRACT

The aim of this work is to present the practical applications of an integrated use of soft and hard methodologies applied in a case study of the Surgical Centre of the University Hospital Clementino Fraga Filho, where the low volume of surgeries is of major concern. The proposed approach is particularly appropriate in situations where there is limited time, financial resources, and institutional cooperation. Cognitive maps were used to elicit the perspectives of health professionals, which supported simulation experiments and guided the model's execution. Human-resource, patient-related, room-schedule, material, and structural constraints were found to affect the number of surgeries performed. The major contribution of this paper is the proposal of a multi-methodological approach with a committed focus on problem solving that incorporates specialists' views in simulation experiments; these specialists' collaborative work highlights actions that can lead to the resolution (or improvement) of real-world problems.

© 2015 The Authors. Published by Elsevier B.V.

This is an open access article under the CC BY-NC-ND license

(<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

The use of operations research (OR) in healthcare differs from its use in other fields because of the special characteristics of healthcare, including the differing influence of the decision-making of different stakeholders and the existence of an indirect command line, as described by Brailsford and Vissers (2011). Moreover, there are challenges in the use of OR in healthcare; Kopach-Konrad et al. (2007) identified some of these to be the rigid division of work in health service operations and management and the scepticism and mistrust of health professionals regarding agents from other fields. It is therefore very important to maintain an interface between OR researchers and health professionals to ensure the success of the research and its applications. According to Hämäläinen, Luoma, and Saarinen (2013), this can be linked to Behavioral Operations Research (BOR), since it is a “behavioral aspect related to the use of OR methods in modelling, problem solving and decision support”.

Soft OR methods can contribute significantly to this purpose and provide a focus for system participants when building solutions; they represent a commitment to the problem which these participants want to solve. These features may be related to the observation made by Brailsford and Vissers (2011) that there is an increasing number of health-related studies using soft methodologies.

In addition to soft methodologies, hospital managers who face financial constraints need hard methodologies to provide quantitative information on the impact of proposed actions, enabling them to allocate available resources more effectively. However, direct experimentation in health services can harm patients. Thus, discrete event simulation (DES) methods are often used in health service studies to enable evaluation in both an operational and a strategic context (Davies & Davies, 1995; Lagergren, 1998).

Howick and Ackermann (2011) discussed the mixed use of different methodologies, emphasising the lack of ‘generic lessons’ in the literature arising from using different methodologies. These lessons may include obstacles encountered in conducting studies, perceived limitations of models, observations regarding the quality of models, and the results.

This study was an original and independent initiative that was supported by the health professionals of the hospital where the case study took place but absent of any long-term funding. It is a simplified

* Corresponding author. Tel.: +55 21982327777.

E-mail address: lampessoa@terra.com.br (L.A.M. Pessôa).

model, with quantitative and qualitative elements, appropriate for situations where there is limited time, financial resources, and institutional cooperation. It aims to present a methodology combination—a variety of multi-methodology (Mingers & Brocklesby, 1997) wherein the methodologies complement each other, which affords several advantages for modelling and simulation experiments—and apply this combination in a case study. The major contribution of this paper is the proposal of a multi-methodological approach with a committed focus on problem solving that incorporates specialists' views in simulation experiments, working collaboratively to signal actions that can lead to the resolution or improvement of real-world problems. The lessons learned during the execution and the presentation of the discussion may be valuable for future work in healthcare and OR.

The following section presents the theoretical background and some contextual information, which guided our procedure in the case study. Section 3 presents the abstract model in some detail. Section 4 states the case study and its results. Finally, we discuss the results in Section 5, and report the conclusion in Section 6.

2. Background

2.1. Theory

In contrast to classic, 'hard' OR, where structuring is only an implicit issue, soft OR makes the ill-structured nature of the problems encountered explicit (Mingers & Rosenhead, 2004). Ackoff (1979a, 1979b) wrote some seminal critical papers on the use of OR in the 1960s and 1970s, revealing that OR had become a set of theoretical disciplines that were disengaged from real world applications. Among the several important books on soft OR, we can cite Checkland (1981), Rosenhead and Mingers (2001), and Pidd (2003). Two of the most widely used methods for problem structuring are Soft Systems Methodology (SSM), proposed by Checkland (1992), and Strategic Options Development and Analysis (SODA), proposed by Eden (1989).

Cognitive mapping is an important resource used in SODA (Eden, 1989) that proposes a networked and graphic structure that helps overcome sequential communication in spoken and written language. Moreover, cognitive mapping allows for constructive communication, as each participant can focus on the issues about which he or she is most concerned. According to Eden (1989), one of the interesting features of cognitive mapping is that the decision-maker can learn about the situation because of the reflexive characteristic of the maps. It makes the stakeholder very clear about his/her own knowledge or point of view, which can be interpreted as a form of metacognition. This stimulates a metacognitive approach to the problem (Lins, 2014).

Cognitive mapping consists of a network in which nodes represent questions regarding the particular stakeholder perspective. Fiol and Huff (1992) classify them into identity maps, characterisation maps, and causal maps, the last of which is the most frequently used in organisational studies. The cognitive map developed in this study is a causal map, as it possesses the following characteristics: it identifies causal relations, produces sequences of actions and conditions that produce desirable results, and indicates logical decisions for alternatives that achieve relevant goals.

Although soft and hard OR are seemingly conflicting paradigms (Mingers & Brocklesby, 1997), Lagergren (1998) reported that the use of both soft and hard OR can achieve better model acceptance. Kotiadis and Mingers (2006) discussed two approaches to using both OR paradigms: in one approach, the methodologies, in whole or in part, are combined and used together without consideration of their different paradigms; in the other, the methodologies are combined while respecting 'their underpinning paradigms'. Howick and Ackermann (2011) presented a review of case studies that mix different methodologies and used a set of interest aspects to classify these methodologies. We try to make these aspects very explicit in this case study. Howick, Eden, Ackermann, and Williams (2008) com-

bined system dynamics and causal mapping, exploring the benefits of both techniques. Kotiadis et al. (2012) described how the Performance Measurement Model enhances SSM in a real life study and cites other examples of hard OR and SSM associations.

Before 2000, few studies directly combined DES and soft OR methodologies (Robinson, 2001). Sachdeva, Williams, and Quigley (2006) used cognitive maps to identify what DES has not provided and to explain the results of various DES experiments. Kotiadis and Mingers (2006) discussed in depth the benefits and drawbacks of both SSM and DES by conducting a case study wherein SSM and DES were combined. Pidd (2007) described a complementary relationship between Problem Structuring Methods (PSM) and simulation for better practice, while Kotiadis (2007) presents a framework for applying SSM to determine simulation objectives, particularly for conceptual modelling. Robinson, Worthington, Burgess, and Radnor (2013) compared a number of studies on their use of DES, while Kotiadis, Tako, and Vasilakis (2014) emphasized the interaction among researchers and stakeholders.

Other important issues are quality requirements as defined by Robinson (2002) regarding not only the validation but also the accreditation and acceptance of the model. As an example, Robinson et al. (2013) noted the need for greater involvement between clients and analysts. This kind of concern can be traced to Lehaney, Kogetsidis, and Clarke (1996), who proposed that communication is improved by the closer proximity between analyst and client. Cognitive maps can provide a way for hospital health professionals and OR analysts to collaborate so that a solution is developed collaboratively and is not imposed on the system.

2.2. Contextual background

It can be argued that the situational features of a problem may partially define the methodological choice for solving it (Munro & Mingers, 2002). The integration between cognitive mapping and DES was based on the following assumptions:

- Limited institutional cooperation: the decision makers would not be involved from the beginning of the study. Thus, there would be no expectation of negotiated decision-making and a complete intervention would be impossible.
- Mission: The mission was an objective aligned with the strategic objectives of the system, but it was restricted to an operational context.
- Limited resources (temporal and financial): limited resources did not allow decision makers to provide a cyclical treatment of the problem, as they could have if given more time and funds.
- Operational stakeholders' participation: using the stakeholders' views of the problem, we aimed to achieve better acceptance and identification through transparency. The idea was to build a trusting relationship, lower the barriers between staff and researchers, and develop solutions together.

Structuring methods such as SSM could provide a more comprehensive and in-depth approach to the problem. However, its use would require negotiation between different actors and a cyclical process structure (Checkland, 2000). Robinson (2010) recognised that developing a desired (ideal) model may become infeasible because of resource constraints (e.g., data, time). Nevertheless, it is important to strive to identify culturally feasible solutions, as proposed in SSM (Checkland, 1992).

3. Materials and methods

The proposed methodology is based on the combination of a structuring approach, using cognitive mapping to represent the problem according to the stakeholder's view, and DES.

Download English Version:

<https://daneshyari.com/en/article/6896569>

Download Persian Version:

<https://daneshyari.com/article/6896569>

[Daneshyari.com](https://daneshyari.com)