



# Organisational design and development in a large rail tunnel project — Influence of heuristics and mantras

Therese Eriksson <sup>a</sup>, Anna Kadefors <sup>a,b,\*</sup>

<sup>a</sup> Department of Technology Management and Economics, Chalmers University of Technology, Göteborg, Sweden

<sup>b</sup> Department of Real Estate and Construction Management, KTH Royal Institute of Technology, Stockholm, Sweden

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## Abstract

In design phases of large and complex infrastructure projects, a main challenge is to coordinate numerous technical specialists. Heuristics, or cognitive rules of thumb, is one factor that may influence the development of organisational structures and routines, especially if project management discretion is high. A longitudinal case study, comprising non-participant observation over three years, was carried out of the early design phase of a major railway tunnel project. Availability and familiarity heuristics were found important, as well as coordination neglect — a general tendency to focus more on partitioning tasks than on coordination needs. Satisficing, meaning that the first acceptable organising solution is selected and retained, was found to be strong in temporary, transitory contexts. Shared heuristics were manifest as short catchphrases, or mantras. Clients should develop meta-routines and meta-functions to support adaptation within, and learning between, projects.

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## 1. Introduction

Organising and managing large infrastructure projects is a truly challenging task. Such projects are frequently located in urban settings and have high environmental impact in terms of ecology, cultural heritage, mobility and city life in general. They are governed by rigorous planning regulations and require government approval in multiple dimensions and stages. Technical challenges and uncertainties are often significant, especially in the case of underground construction, and project organisations involve a large number of firms, in many cases related to each other by contracts. The complexity and uncertainty means that coordination needs are very high, and traditional management strategies based on extensive pre-planning and control are often found inadequate. Accordingly, much research on the management of such projects has focussed on how to balance between flexibility and control (Dvir and Lechler, 2004; Hertogh and

Westerveld, 2010; Koppenjan et al., 2011; Olsson, 2006; Pollack, 2007; Szentes and Eriksson, 2016). The emphasis has mainly been on effects and outcomes of various management strategies. However, to influence which strategies are employed in practice it should be equally important to understand their origins: How are principles for managing large infrastructure projects selected and which factors influence these choices?

In this paper we aim to provide a deeper understanding of how organisational structures and coordination mechanisms emerge and develop over time in large and complex infrastructure projects. The empirical basis is a longitudinal, qualitative case study of the early design phase of a Swedish railway tunnel project. At the start of this phase, project organisations grow significantly and numerous specialists become involved, on the client side as well as within the private consultancy companies performing design tasks. Important decisions are made that impact considerably on project outcomes and value to society (Gil and Tether, 2011; Zerjav, 2015). The case project was also subject to a process of outsourcing to external consultants tasks previously performed in-house by the client. The study describes decisions made upfront at the start of the early design phase, but also how organisational structures and routines

\* Corresponding author.

E-mail addresses: [anna.kadefors@chalmers.se](mailto:anna.kadefors@chalmers.se), [anna.kadefors@abe.kth.se](mailto:anna.kadefors@abe.kth.se) (A. Kadefors).

were modified over time in response to increased awareness or a changing environment.

Because large infrastructure projects tend to be unique in their contexts, there are no comprehensive standard models for how to organise and manage them. Project management functions often have considerable freedom in setting both the organisation and many of the management routines (Szentcs and Eriksson, 2016). This implies that organising in these projects is highly dependent on how the project managers understand their environment and select the responses they perceive as appropriate. Such cognitive capabilities can be seen as microfoundations of organisational routines (Eggers and Kaplan, 2013). Thus, several authors (Pentland and Hørem, 2015; Look and Hinnen, 2015) have recently suggested that literature on heuristics should be useful to understand organising processes. Heuristics are shortcuts or simple rules of thumb that guide decision-making. They may operate on a subconscious level but can also be deliberate and articulated (Bingham and Eisenhardt, 2011; Chow, 2014; Look and Hinnen, 2015). In the context of large projects, previous studies of heuristics have primarily focused on the influence of optimism bias, that is, the tendency to underestimate risks for negative events, in investment decisions (Flyvbjerg et al., 2003; Klakegg et al., 2016).

In this paper, we describe and analyse the role of cognitive heuristics in shaping project organising, but also how project managers themselves use shared simple rules as part of their own strategies to coordinate other project participants. We consider two dimensions of organising: organisational structures and routines for coordination. Organisational structures refer to how the project organisation is designed: which competences are involved, how work is partitioned and responsibility allocated, while organisational routines are “repetitive, recognizable patterns of interdependent actions, involving multiple actors” (Feldman and Pentland, 2003). The collective dimension makes routines central to coordination (Becker, 2004).

The paper is organised as follows: First, we briefly introduce aspects that shape conditions for coordination and adaptation in large projects. Next, we describe key concepts and findings in research on heuristics and identify the set of heuristics used as an analytical framework in the paper. Then, the case study methodology is outlined, followed by a section where case findings are described and analysed. Finally, conclusions are summarised and implications for practice and future research outlined.

## 2. Coordination and adaptation in large projects

Projects have in common that they are temporary organisations and designed to be dissolved (Söderlund, 2011). However, there are considerable differences between categories of projects (Lundin and Söderholm, 1995). Thus, many projects are small, standard and highly routinised (Davies and Frederiksen, 2010; Lundin and Söderholm, 1995). There are also truly unique projects where uncertainty is high and little previous experience exists (Söderlund et al., 2008), as well as vanguard projects, where new ways of working may be tried out and spread to subsequent projects (Brady and Davies, 2004; Davies and Brady,

2016). As stated above, infrastructure projects are often large and complex. However, although many aspects in the societal, technical and organisational context of an infrastructure project are unique, especially in a local environment of a city or region, similar projects are repeatedly being undertaken on the national and international levels. Also, large such projects share many characteristics with smaller ones. Thus, for infrastructure projects, as for construction projects in general, routines and organisational designs are to a considerable extent institutionalised on the industry level (Beamish and Biggart, 2012; Bechky, 2006; Kadefors, 1995).

Further, many large infrastructure projects are subject to high uncertainty, which means that they need to adapt to changing circumstances over time. This applies not only to technical solutions and scope, but also to organisational structures and routines (Davies and Brady, 2016; Le Masurier et al., 2006). Routines may develop over time in several ways. Feldman and Pentland (2003) showed that such patterns of action are often modified in small steps, through ongoing and often unrecognised processes of successive evaluation and adaptation in daily work. Changes in routines may also be of a more fundamental and dramatic character: Jarzabkowski et al. (2012) highlight how environmental changes or managerial intervention lead to disruptions of existing routines and, subsequently, to perceived absence of coordination. These gaps are filled by new routines, assembled from selections of known coordinating elements. Further, change may result from planned cycles of review and revision of existing practices. Research on knowledge management and innovation (Nelson and Winter, 1982; Parmigiani and Howard-Grenville, 2011; Zollo and Winter, 2002) has increasingly emphasised the role of such meta-routines, or dynamic capabilities, for revising and updating operating routines. For the purpose of this paper, it is important to understand how both project organisations and project routines are adapted to changing circumstances, to what extent such adaptation is based on planned and recurrent evaluation and feedback, and how heuristics influence adaptation.

## 3. Heuristics — an analytical framework

In the last decades, psychological research has identified a wide array of heuristics, sometimes called biases, which individuals intuitively apply when making decisions in uncertain and complex situations (e. g. Bazerman, 1998; Tversky and Kahneman, 1974). Biases affecting decision-making in social contexts, such as principles of stereotyping and attribution, have been studied in social psychology (e. g. Gilovich et al., 2002). The emphasis is often on how heuristics and biases cause deviations from rational thinking. It is generally assumed that there is a trade-off between accuracy and effort: more information-processing will produce a better decision, but a heuristic can yield a satisfactory response with much less cognitive effort (e.g. Kahneman, 2011; Simon, 1956, 1972).

However, the concept of heuristics is ambiguous. In a literature review, Chow (2014) found that although the view of heuristics as “simple rules of thumb” was prevalent, a common definition of the term was lacking and that the meaning varied between different fields. In effect, heuristics can signify both

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