Available online at www.sciencedirect.com

ScienceDirect

International Journal of Project Management 35 (2017) 121 – 135

International Journal of Project Management

www.elsevier.com/locate/ijproman

Errors, lies and misunderstandings: Systematic review on behavioural decision making in projects

Verena Stingl *, Joana Geraldi

Technical University of Denmark, Department of Management Engineering, 2800 Kgs. Lyngby, Denmark

Received 9 June 2016; received in revised form 3 October 2016; accepted 20 October 2016
Available online 16 November 2016

Abstract

This paper provides a systematic review of the literature on behavioural decision making in projects. The field is blooming, and given the relevance of decisions in projects and the strong theoretical foundations of behavioural decision making, it offers to contribute to practice and theory in projects and beyond. However, the literature is fragmented and draws only on a fraction of the recent, insightful, and relevant developments on behavioural decision making. This paper organizes current research in a conceptual framework rooted in three schools of thinking—reductionist (on cognitive limitations—errors), pluralist (on political behaviour—lies), and contextualist (on social and organizational sensemaking—misunderstandings). Our review suggests avenues for future research with a wider coverage of theories in cognitive and social psychology and critical and mindful integration of findings and concepts across three schools.

Keywords: Decision making; Behavioural decision making; Cognition; Sensemaking; Systematic review; Project studies

1. Introduction

Making decisions is integral to the management of projects. Plenty of normative guidance, including tools and methods, aid the rational decision making process (Hazır, 2015). However, the actual decision behaviour deviates strongly from the rational ideal, as abundant research in behavioural decision making demonstrates.

Behavioural decision making "*endeavours to understand the actual influences on actors on making choices*", (Mullaly 2014, p. 519). The study of behavioural decision making in projects has gained momentum in the past 15 years and allows first exploration of the actuality of project decisions (Cicmil et al., 2006), e.g. overoptimism in project forecasts (e.g. Flyvbjerg, 2007, 2013), escalation of commitment (e.g. Alvarez et al., 2011; Van Oorschot et al., 2013), or ineffective risk management (e.g. Kutsch and Hall, 2005, 2010).

The literature draws from different general theoretical foundations in organizational theory, and cognitive and behavioural sciences, including Groupthink (Hällgren, 2010), sensemaking (Musca et al., 2014), self-justification theory (Jani, 2008), risk propensity and uncertainty avoidance (Keil et al., 2000), or 'planning fallacy'(Flyvbjerg, 2013), among others. All in all, the research displays strong heterogeneity in terms of theoretical background and researched phenomena, thus reflecting the multi-faceted nature of project decision behaviour.

While theoretical pluralism is essential to grasp the complexity of decisions in projects (Winter et al., 2006), it bears the risk of falling into the '*fragmentation trap*' (Knudsen, 2003). It is only when theories are interacting with each other that we can fully benefit from theoretical plurality, as suggested in seminal publications in organization studies, e.g. the critical comparison between theories (Burrell and Morgan, 1979), and the theorizing emerging in the intersection between research perspectives (Zahra and Newey, 2009), and between research paradigms (Lewis and Grimes, 1999).

* Corresponding author.
E-mail addresses: verst@dtu.dk, v.stingl@gmx.at (V. Stingl).

http://dx.doi.org/10.1016/j.ijproman.2016.10.009
0263-7863/00/

Literature reviews and conceptual frameworks can capture theoretical pluralism, offer a deliberate integration, combination, or parallel consideration of the theoretical concepts, and thereby foster cross-fertilization, new ideas and the overall development of the field (Knudsen, 2003; Shapira et al., 1994; Söderlund and Geraldi, 2012; Söderlund, 2011). However, past reviews fail to provide a comprehensive overview of the literature on behavioural decision making in projects, and focused instead on specific aspects, namely decision makers' concept of risk (Zhang et al., 2011), decisions in mega projects (Sanderson, 2012), and cognitive biases (McCray et al., 2002; Shore, 2008).

The present study will contribute to close this gap. Its purpose is to display and analyse the theoretical pluralism in the literature on behavioural decision making in projects, and point to potential future research. This article asks (1) How is behavioural decision making studied in the project literature? (2) What gaps exist in the current research on behavioural decision making in projects? (3) How does the project literature relate to the grand theories of behavioural decision making? We will address these questions by populating an established conceptual framework, considering the onto-epistemological foundations of behavioural decision making theories, with related project literature, captured through a systematic review.

Our aim is not to foster unification, but to offer a structured understanding of the current theoretical pluralism, and thereby identify gaps and opportunities for future research within and across theoretical foundations. This study contributes to the literature as it a) provides a holistic synthesis of the research on behavioural decision making in projects, b) analyses the relationship between this research and the theoretical foundations of behavioural decision making, and c) points to possibilities of integrating research findings from different theoretical backgrounds whilst carefully considering their onto-epistemological differences. The article contributes to practising decisions by suggesting how behaviours impact decisions, and reviewing coping mechanisms offered by the literature.

The next section will propose a framework of three 'schools of thought' in behavioural decision making, followed by methodology. We then will analyse the project literature within each of the three schools, and the literature following a mixed-school approach. In the discussion, we propose avenues for future research within each school, and highlight limitations and opportunities of the mixed-school approach. In conclusion, we will return to the research questions, establish contributions and limitations of current work.

2. Three schools of thought in behavioural decision making

To meet our objective, we needed to build on a framework that is holistic, strongly rooted in cognitive and behavioural sciences and is explicit about the ontological and epistemological foundations of the theories. Such a framework highlights the boundaries, assumptions, major findings, challenges, and potential future of the field (Shapira et al., 1994). We identified such a framework in Powell et al.'s (2011) three schools of thought for Behavioural Strategy.

Grouping the literature according to schools of thoughts is popular in project studies and beneficial for the development of research. The use of schools of thought enables a systematic search for gaps and competing theoretical explanations within and between schools. In consequence, making the schools explicit will illustrate the current theoretical pluralism in the field, and will assist and promote the study and integration of the individual findings. It is thereby a mean to identify both conflicts between schools, or potential overlaps and opportunities of complementation, and thereby stimulate future debate and research (Knudsen, 2003; Söderlund, 2011).

Powell et al. (2011) introduced three schools of thought to organize the research on Behavioural Strategy, that is, research on strategy management based on cognitive and behavioural science. Powell and colleagues structured the literature according to their respective onto-epistemological foundations and identified three conceptually distinct schools. These schools draw from separate theoretical foundations, are fundamentally different in their philosophies, and, in consequence, follow different methodologies. Powell et al. named the three schools: *Reductionist, Pluralist*, and *Contextualist*. We will only briefly introduce the three schools here, and examine them in relation to project literature more thoroughly later in the article.

The *Reductionist* school adopts a strictly positivist, objectivist, and realist view. As such, it analyses deviations from a 'normative ideal', i.e. a rationally right trajectory or decision. Deviations are labelled as biases and errors, and their roots and extent are analysed through mostly quantitative methods.

The *Pluralist* school is based in pragmatism and draws from multiple theoretical foundations, hence following a pluralistic approach. While still adhering to a rational, normative ideal as a reference, the reasons for 'deviations' are sought in intra-group conflicts, resulting in opportunistic behaviour, bargaining, and conflicts. Methodologically, this school builds on the same pluralism as for its theoretical foundation, using qualitative, quantitative and mixed methodologies.

Finally, the *Contextualist* school embraces a phenomenological or constructionist view. Unlike the other schools, contextualist research does not define an 'optimal' reference point for the 'right' decision. Instead, the focus is less on the decision, but the process leading to it, and the context in which it takes place. The methodologies are therefore typically qualitative.

In their paper Powell et al. argued that the identification and acknowledgement of the paradigmatic differences of these three schools of thought were a necessary starting point to adopt *'a policy of methodological pluralism and multimethod research'* (p.1380).

Their framework is a suitable starting point for organizing the literature in project studies and addressing our research questions for three reasons. First, although focussing on strategy, the presented schools are strongly linked to decisions and reflect the same types of influences that actors in project decisions are facing. Second, the proposed framework builds on the grand theories of cognitive and social sciences in behavioural decision making, and also on organizational theory and strategic management, thus providing a solid foundation for exploring missing or inaccurate connections to the grand theories. Third, the framework presents

clearly the assumptions, boundaries and onto-epistemological foundations of the theories. In doing so, this framework helps to identify possibilities for translations and serves as a fruitful tool for researchers to connect the studies on behavioural decision making.

3. Methodology

3.1. Choice of methodology

We conducted a systematic literature review to develop an overview and synthesis of the research on decision behaviour in projects. The analysis of the articles was guided by Powell et al.'s (2011) framework.

We have chosen a systematic literature review because it introduces the rigour of research methodology into literature reviews, thus improving quality. A core difference between a systematic review and a traditional narrative review is the search for and analysis of a comprehensive sample of publications. The methodology involves systematic data collection procedures, descriptive and qualitative data analysis techniques, and theoretically grounded synthesis. Its objective is a conceptual consolidation across a fragmented field; it identifies different streams of research and develops a coherent synthesis of research in a systematic, transparent and reproducible way (Tranfield, et al., 2003, p. 220). Therefore, the systematic identification and analysis of articles is suitable to capture different onto-epistemological stances and theoretical foundations in behavioural decision making research in projects.

The systematic review followed a two-stage process adapted from Tranfield et al. (2003).

3.2. Planning stage

The *planning stage* evaluated the relevance and objective of the literature review. We discussed our plan with a practitioner and two other academics in the fields of behavioural decision making and project management, and presented an early and modified version of the article in a conference. Our objective was to validate the study's relevance, theoretical foundation and methodological rigour.

3.3. Execution stage

The *second stage* of our systematic review, execution, followed a 6-step process. After preliminary scoping (Step 0), Steps 1–3 concern the sampling process, and explain our selection criteria. The final step was the systematic analysis of the studies. The refinement of the sample size during the steps is shown in Table 1.

3.3.1. Step 0: scoping

We decided to follow Müller et al.'s definition of a decision as a "*cognitive phenomenon and conceptualized as the goal or end point for a more or less complex process of deliberation which includes an assessment of consequences and uncertainties*." (2009, p. 76). Our focus is therefore on deliberate decisions, and the deliberate study of decisions. Routines and generic topics related, but not explicitly contributing, to decision making are henceforth out of scope.

Table 1
Selection of studies.

	Step 1: Keyword search	Step 2.1: Focus on behaviours	Step 2.3: Focus on decisions	Step 3: Snowballing	Final sample size
IJPM	282	65	31	–	31
PMJ	56	18	9	–	9
IJMPiB	48	6	6	–	6
Others	–	–	–	9	9
Total	386	88	46	9	55

Our object of analysis is project studies—research and research community dedicated to the study of projects (Geraldi and Söderlund, 2016). Therefore, the starting point of the systematic review was the three main project management journals, *International Journal of Project Management (IJPM)* and *Project Management Journal (PMJ)*, and *International Journal of Managing Projects in Business*. The journals represent the main body of research in project studies.

3.3.2. Step 1: keyword search

We conducted a keyword search for the term 'decision*' in the fields: title, abstract, and keywords. The keyword includes "decision making", "decisions", "decision-maker", etc. and thus reflects the diversity and breath in theoretical foundations of behavioural decision making, and its study. We have used ScienceDirect for IJPM (1983–2015; Volume 1 to 33), Wiley Online for PMJ (1999–2015; Volume 30 to 47) nd Emerald Insight for IJMPB (2008–2015; Volume 1 to 8). Conference papers were not included in the sample.

The keyword search resulted in 386 papers.

3.3.3. Step 2: refinement

Refinement focused the sample of articles on behavioural decision making through two steps:

- *Step 2.1:* Screening abstracts and keywords for research directly related to behavioural decision making. This eliminated publications related to normative decision theory and support tools.
- *Step 2.2:* Thoroughly reading the remaining abstracts and further refinement to research explicitly addressing decisions. This eliminated articles with a focus on general behaviour but not directly linked to decisions.

After step 2, the sample was reduced to 46 articles relevant to the literature review.

3.3.4. Step 3: snowballing sampling

As suggested by prior literature reviews (Kwak and Anbari, 2009; Söderlund, 2011), articles outside project management main journals may also be relevant. This is a common challenge in systematic literature review. Following Tranfield et al., a subsequent snowballing approach mitigated this challenge.

Therefore, as we read the 46 remaining articles (and their respective references), particular care was given to publications cited by more than one article which were not part of the selected pool of articles and journals. The aim of this step was to add relevant literature in the area that was not necessarily published in key project management journals. We added 10 additional articles to the sample after this step, making a total of 55 articles for this review.

3.3.5. Step 4: data analysis

The analysis of the data was structured according to a series of questions. Thus we could clarify concepts and theoretical foundation of each publication, and classify the articles according to Powell et al.'s framework. We could also identify overlaps, conflicts or complementary areas between the various contributions.

- Ontology: Do the authors assume the existence of a rationally 'right' decision?
- Epistemology: What methodology do the authors use to develop and/or test their theory?
- Research problem: What was the research problem (issue)?
- Theoretical contribution: What theoretical explanation is given for the problem/decision behaviour?
- Practical contribution: What recommendations for practice do the authors offer?

The papers were first scanned for answers of the two first questions regarding the onto-epistemological foundation of the publication, and assigned to the three schools.

However, we identified 19 publications that drew from more than one school, therefore, we introduced a fourth group of articles, called 'mixed schools'.

After grouping according to schools, we addressed the last three questions through thorough reading of the individual articles. Answers to all five questions were collected in a table for each group including a summary of the article formulated to reflect the aim of the systematic review. Tables 3, 4, 5, and 6 are condensed versions of these tables. Those tables allowed a structured, concept-centred analysis of the literature within each school, identifying communalities and differences.

4. The three schools of thoughts in projects

The different philosophical foundations of the three schools can be translated into their individual assumptions related to their definition of a 'good decision', and, in consequence, what they perceive as the 'problem' with decisions or the decision process. Table 2 provides an overview of the characteristics and foundations of the three schools.

As stated earlier, the *Reductionist* school's norm of reference is a rational decision. Reductionist research compares observed decision behaviour to optimal decision behaviour according to normative decision theories. The object of research is the deviation from the norm, the 'bias' or 'error'. The underlying positivist ontology and consequential assumption of the existence of an optimal decision is clearly expressed in the respective literature, e.g.:

- *"[..] errors of judgment are often systematic and predictable"* (Flyvbjerg 2013, p. 761)
- *"project managers who accurately perceive the risks of a failing endeavour are less likely to continue with failing projects"* (Jani 2011, p. 934),

Reductionist research searches for the roots of irrational decision behaviour. Those roots are found in the decision maker's bounded rationality (Simon, 1982) and other cognitive biases. Hence, the research builds on the works of Kahneman, Tversky, Slovic and Lovallo, exploring concepts like optimism bias and planning fallacy (Lovallo and Kahneman, 2003), prospect theory (Kahneman and Tversky, 1979), or illusion of control (Slovic, 1987). The methodology is in consequence mostly quantitative, building on the experimental approach of psychology and cognitive sciences.

Reductionist research explores approaches to reduce biases and thus increase the rationality of the decision maker. The reductionist literature offers various 'de-biasing methods', e.g. taking the outside-view (Lovallo and Kahneman, 2003), reference class forecasting (Flyvbjerg, 2007), or introduction of a devil's advocate. However, Flyvbjerg (2007), who has also published pluralistic research, points to the limitations of those approaches in projects where organizational and political influences are high.

The *Pluralist* literature shares the Reductionist's notion of a 'good decision' based on rational reasoning. In that line, the authors speak of '*optimal decision*' (Chapman et al., 2006) or '*optimum outcome*' (Kujala et al., 2007). Again, the object of research is the roots of '*inaccurate forecasts*' (Flyvbjerg, 2007) and sub-optimal decisions. Pluralist research identifies the origins of these biases within personal interests, or political or opportunistic behaviour. The research is based on concepts of negotiation and bargaining and following strongly the ideas laid out in Cyert and March's (1963) '*A behavioral theory of the firm*'. In general, the literature is focussed on the impact of deviating interests (e.g. Pinto, 2014; Yang et al., 2014) and opportunistic behaviour (e.g. Chapman et al., 2006). Other studies provide approaches to overcome potential negative impacts (e.g. Kujala et al., 2007).

The *Contextualist* school breaks with the assumption of a rational decision and stresses the relevance of the decision context. A key theme in the contextualist literature is the convergence of sense and meaning as an enabler for decisions that are perceived as 'right' or successful—either in the moment or in retrospect (Alderman and Ivory, 2011; Musca et al., 2014). Contextualist literature analyses decisions as the result of a sensemaking process (Weick, 1995), in which members of a group organize the cues they perceive, so the cues build a logical structure, i.e. a way that 'makes sense'. Obtained cues, prior believes and opinions, culture, the interactions between actors, and other factors shape realities and form 'narratives', which provide accounts for 'what is going on'. The narratives can strongly diverge within and between

Table 2
Overview of the three schools (adapted from Geraldi and Stingl, 2016).

	Reductionist	Pluralist	Contextualist
Ontology in relation to decisions	Decisions should be rational, and deviations from rationality should be mitigated.	Decisions are negotiation arenas, prone for conflict of interests, bargaining and opportunistic behaviour.	Decisions are sensemaking processes, intertwined in the negotiation of meaning before, during and even after the project.
Assumptions about decision maker's behaviour	Decision makers (or groups of decision makers) make decisions consciously as 'events' but are bounded-rational, and hence cognitively limited.	Decision makers are rational and strongly influenced by personal and political interests, which can be in conflict with that of the project.	Decision makers do not 'make' decisions, but are actors constructing narratives which will shape processes of attention, prioritization and ultimately decisions.
Core processes of interest	Individual and intragroup decision making	Intergroup bargaining, problem solving, politics, conflict resolution, organizational learning, resource allocation	Sensemaking, perception, enactment, action generation
Caricature of project actors portrayed in research findings	The optimist: project actors suffer from pronounced optimism bias	The opportunist: project actors have their own interests at heart	The orchestrator: project actors surf on waves of meaning, in an highly ambiguous world
Key generic concepts in social and cognitive psychology	Cognitive biases; heuristics; bounded rationality; subjective utility/probability; personality types, groupthink	Conflict culture; decision process (inclusion/participation); intra-project communication; negotiations/bargaining; game theory	Culture (Hofstede model), language, signs & symbols, values, taboos, sensemaking, storytelling, future perfect strategising
Typical methodologies	Positivist research, marked by experimental research, modelling and simulation	Critical realist, socio constructivist, marked by qualitative and multi-method tradition.	Socio constructivist, marked by qualitative, in-depth studies, ethnography, grounded theorizing.
Examples of classic contributors	Edwards, Simon, Von Neumann-Morgenstern, Tversky-Kahneman, Schelling, Bazerman, Loewenstein, Lovallo	March, Cyert, Simon, Fiske-Taylor, Bower, Miller, Kets de Vries, Hambrick, Levinthal, Denrell, Bromiley, Rumelt, Winter	Weick, Starbuck, Pettigrew, Brunsson, March, Staw, Mintzberg, Abrahamson, Reger, Huff, Fiol, Milliken, Hodgkinson, Bettis, Mitroff
Examples of contributors from project studies	Flyvbjerg, Jani, Keil, Shore, Martinsuo, Kutsch, Hällgren, Williams	Flyvbjerg, Pinto, Kujala, Clegg, Winch, Chapman, Mullaly	Pitsis, Alderman, Musca, Winch

groups. This divergence may create highly different interpretation of new cues, development of different alternatives for action or different assumptions about the future. Contextualist research focuses on these gaps between narratives and explores how a convergence of meaning can be fostered through negotiation, dialogue and other contextual factors.

The scientific methods of the Contextualist School are strongly based in qualitative research, usually (longitudinal) in-depth case studies or ethnographic studies that follow the sensemaking process and the development or convergence/divergence of narratives in selected exemplary projects.

4.1. Reductionist school in project studies

Table 3 provides an overview of the literature following the reductionist view. A good entry point to the reductionist school is the articles of McCray et al. (2002) and Shore (2008), which provide a theoretical analysis of the relevance of cognitive biases in project decisions. While McCray et al.'s work is purely conceptual, Shore's review on systematic biases links nine systematic biases from the generic literature with eight case studies of failed projects.

A series of empirical studies have researched the relevance of individual biases in specific project phenomena. The two main project phenomena studied were escalation of commitment (Du et al., 2007; Hällgren, 2010; Jani, 2008, 2011; Keil et al., 2000; Martinsuo et al., 2013; Meyer, 2014), and overoptimistic plans and forecasts (Flyvbjerg, 2013; Kutsch et al., 2011; Son and Rojas, 2011). Other topics of interest in the reductionist literature are furthermore inefficient resource allocation (Eweje et al., 2012), gold plating (Shmueli et al., 2015), lack of learning (Sengupta et al., 2008), or failure to communicate early warning signs (Ekrot et al., 2015).

Escalation of commitment (EoC) is a typical problem in projects, and has been present in the literature of organizational studies from the mid 1990s onward (e.g. Ross and Staw, 1993). EoC describes situations in which projects are continued although 'objective' criteria like significant cost overruns and extreme delays indicate project failure. Reductionist research provides various explanations based on cognitive limitations for this phenomena, among which Jani (2008) lists self-justification theory, prospect theory, agency theory, or hypotheses like the 'sunk cost effect' (Keil et al., 2000) and the 'project completion effect'. Project research specifically adds the long-term impact of early formation of value judgments (Martinsuo et al., 2013), groupthink (Hällgren, 2010), and most prominently: optimism bias (Du et al., 2007; Jani, 2008, 2011; Meyer, 2014).

Optimism bias describes the overestimation of positive outcomes and/or the underestimation of potential negative outcomes. It is an umbrella term for a subset of various cognitive biases like self-efficacy theory, illusion of control, or outcome desirability. Illusion of control has been of particular interest to reductionist research, when perceived control over specific project risks leads to downplaying and underestimating the risk. Research showed increased levels of perceived control in endogenous (vs. exogenous) project risks (Du et al., 2007; Jani, 2008, 2011), or for tasks with high perceived self-efficacy (Jani, 2008, 2011). Keil et al. (2000) also linked culturally moderated risk propensity and uncertainty avoidance with risk perception and the willingness to continue a risky project.

Table 3
Overview on reductionist research literature.

References	Research problem	Theoretical basis	Methodology
(Du et al., 2007)	Project termination	• risk perception • illusion of control	Simulation experiment 140 students (general population); 118 IT project professionals (wireless communication company); US
(Ekrot et al., 2015)	(non) communication of risk information	• employee voice behaviour	Survey 618 project practitioners from 154 firms; cross-sectional; Germany
(Eweje et al., 2012)	Resource allocation	• prospect theory • bounded rationality • illusion of control	Survey 69 project practitioners of one oil and gas corporation; globally
(Flyvbjerg, 2013)	Overoptimistic plans	• planning fallacy • baseline neglect	Conceptual article (development of a planning framework tested a posteriori on a case)
(Hartono et al., 2014)	Differences in risk perception	• loss aversion • illusion of control	Two cross-sectional surveys; 96 project contractors and 99 clients; Indonesia
(Hällgren, 2010)	Underestimation of risks	• groupthink	Case study (1996 Mt. Everest expedition)
(Jani, 2008, 2011)	Escalation of commitment	• self-efficacy bias • illusion of control • indication of anchoring	Simulation experiment—mixed-method (quantitative and qualitative 'think aloud' data 36 students and 35 IT project managers; US
(Keil et al., 2000)	Escalation of commitment	• prospect theory (sunk cost effect) • uncertainty avoidance (culture)	Simulation experiment (quantitative) 536 students from Finland (185), Netherlands (121), and Singapore (230)
(Kutsch et al., 2011)	Overoptimistic forecasts	• delusional optimism • indication of anchoring	Simulation experiment—mixed-method (quantitative and short interviews to explain decisions) 28 teams à 6 European students with relevant work experience (min 3 years)
(Leybourne and Sadler-Smith, 2006)	Improvisation and intuition in project management	• heuristics • improvisation	Cross-sectional survey 163 project practitioners; UK
(Low et al., 2015)	Bid decisions	• culturally moderated risk perception	Mixed method: survey and subsequent face-to-face interviews 44 international project contractors in Malaysia (survey); 18 construction sector professionals in Malaysia (interviews; sample partly overlapping with survey)
(Martinsuo et al., 2013)	Escalation of commitment	• value perception	Cross-sectional Survey 128 practitioners of companies who invest in risky R&D projects; Finland
(McCray et al., 2002)	Project failure	• sixteen different cognitive biases	Conceptual article linking potential impact of cognitive biases to project outcome
(Meyer, 2014)	Escalation of commitment	• optimism bias	Cross-sectional survey 345 practitioners involved in project selection decision; 42% enrolled in post-graduate PM courses; South Africa
(Pinto and Patanakul, 2015)	Project champion personality as driver for portfolio decisions	• Narcissism • Optimism bias • Self-justification theory	Literature review, conceptual article
(Sengupta et al., 2008)	Broken learning cycle (no improvement through experience)	• Feedback delay • fallible estimates (indication of anchoring) • initial goal bias	Overview article, reviewing several prior simulation experiments (practitioners in MBA programs, no specifics on sample given)
(Shmueli et al., 2015)	Over specification ('gold plating')	• endowment effect • IKEA effect • I-designed-it-myself-effect	Simulation experiment (quantitative) 204 senior students of industrial engineering and management; Israel
(Shore, 2008)	Project failures	• nine different cognitive biases	Eight case studies of project failures analysed for potential relevance of cognitive biases
(Son and Rojas, 2011)	Overoptimistic forecasts	• optimism bias • availability bias • anchoring	Modelling (not validated through data)

While not specifically examined through the experimental setup of the study, Jani (2011) also found indication for anchoring as a potential additional explanation for sustained (delusional) optimism.

Overoptimistic initial plans and forecasts are the second main concern of reductionist literature. The relevance of this issue, especially in the infrastructure sector, has been demonstrated abundantly through Flyvbjerg's work (e.g. 2007).

Although Flyvbjerg has developed a strong focus on political behaviour as roots of such biased plans and forecasts (see also the section on pluralist research), he has also contributed to reductionist research, discussing the influence of optimism bias and the resulting phenomena of 'planning fallacy' (Flyvbjerg, 2013). Kutsch et al. (2011) demonstrated the influence of optimism bias on project forecasts in a simulation experiment with follow-up interviews, through which Kutsch and colleagues provided rich data on the quantitative effect of optimism bias and indication of several potential drivers, including motivated reasoning, outcome attribution and egocentricity bias (both similar to self-efficacy bias), and outcome desirability.

Offering de-biasing strategies to provide more 'accurate' forecasts is at the core of Flyvbjerg's work (e.g. 2013). The most elaborate of these strategies consists of a framework that adopts the 'outside view'-method based on Kahneman and Tversky's seminal work (1979), and found interest and use in practice (e.g. UK HM Treasury, 2004). By taking the outside view, the forecaster or project team detach themselves from the project and evaluate it from a neutral position based on benchmarks and historical data, thus reducing drivers of optimism. Such an approach complements other, more mechanistic de-biasing approaches based on elaborate forecasting and risk identification tools to reduce the 'technical' side of the forecasting bias (e.g. Sengupta et al., 2008).

The issue of *'gold plating'* or over-specification is especially relevant in software projects, where an uncontrolled addition of potentially unnecessary features may lead to significant cost overruns, delays and high complexity. Shmueli et al. (2015) have found that high emotional attachment to design elements and involvement in the design lead to higher valuation of the elements and consequential higher propensity for gold plating.

Sengupta et al. (2008) have summarized earlier experimental research on *broken learning cycles* and why experience does not necessarily lead to better performance in their article 'The experience trap'. The studies demonstrate the impact of delayed feedback on accurate mental modelling, the difficulty of abandoning initial goals even in significantly changed environments, and the problem of sustained initial (inaccurate) estimates.

4.2. Pluralist literature in project studies

Although opportunistic behaviour, politicking and bargaining are, in the experience of the authors, a dominant issue in the reality of project practitioners, the literature on behavioural decision making in projects has put little attention to it. As Clegg and Kreiner (2013) conclude, the intersection of project literature and literature on power '*is almost void*'. Consequently, articles subscribing to the pluralist school are relatively scarce (see Table 4).

The two main topics explored in the pluralist literature are overoptimistic forecasts—for which different explanations are offered than in the reductionist literature—and bargaining and negotiations, in particular sub-optimal negotiation outcomes.

While, with regard to *overoptimistic forecasts*, the reductionist attributes inaccuracies in forecasts to the cognitive limitations of the forecasters, pluralist literature is less benevolent and does not shy away from calling these overoptimistic forecasts 'lies' (Flyvbjerg, 2007), or more neutrally termed: 'strategic misrepresentation'. It describes the opportunistic behaviour of individuals and groups, who omit or even falsify information, or exploit information asymmetries and other's biases to win project business, push personal 'pet' projects, maintain or better their position, and access resources. The 'blame' for strategic misrepresentation is usually not sought only within the individual forecaster. Both Flyvbjerg (2007) and Pinto (2014) point to the customer–contractor dynamic, especially in public procurement,

Table 4
Overview on pluralist research school.

Reference	Research problem	Theoretical basis	Methodology
(Chapman et al., 2006)	Overoptimistic forecasts	• conspiracy of optimism • culture of irrational objectivity	Conceptual article
(Clarke, 2010)	Influence of emotion on decisions	• avoidance of anxiety • influencing emotions of others	Qualitative interviews 15 project managers with recent training on emotional intelligence
(Flyvbjerg, 2007)	Overoptimistic forecasts	• strategic misrepresentation	Conceptual article, based on previously published case studies
(Kujala et al., 2007)	Sup-optimal stakeholder negotiations	• negotiations	Conceptual article, development of a negotiation framework
(Mullaly, 2014)	Process and political constraints in project initiation decisions	• organizational routines • power-distribution	Qualitative interviews 28 practitioners (executives and managers) involved in project initiation decisions
(Pinto, 2014)	Overoptimistic forecasts, overpromising, dysfunctional planning/scheduling dynamics	• strategic misrepresentation • normalization of deviation	Qualitative interviews 21 PMs of 3 different companies (engineering, procurement and construction management; IT; manufacture of medical devices)
(Yang et al., 2014)	Balancing of stakeholder claims	• power-distribution • negotiations	Multi-method—(1) interviews, (2) survey, (3) case studies Construction sector; (1) 6 industry professionals (client, contractor, or contractor organization); (2) 183 respondents; (3) 15 practitioners (not overlapping with sample (1) or (2))

where unrealistic goals, promoted by the authorities, drive strategic misrepresentation. However, Flyvbjerg is explicit that optimistic forecasts come from both opportunistic behaviour and cognitive biases, rooted in reductionist theories. He discusses the environment in which one or the other influence prevails in "*From Nobel Prize to Project Management: Getting Risks Right*" (Flyvbjerg, 2006), and provides thus a good illustration of the ontological similarities between pluralist and reductionist theories, while highlighting the different assumptions about the decision process.

While Flyvbjerg's work focusses on the impact of strategic misrepresentation, Pinto (2014) and Chapman et al. (2006) discuss its potential roots. Both studies point to a dysfunctional environment which fosters and encourages strategic misrepresentation. Pinto argues that these organizations suffer from a 'normalization of deviation' in which destructive behaviour like strategic misrepresentation becomes first 'the expected' and then 'the accepted' behaviour, resulting e.g. in systematic over-promising clients or a 'rival camp mentality' during project planning. Chapman et al. (2006), on the other hand, argue that a 'conspiracy of optimism' fosters a climate in which organizational pressure suppresses the acknowledgement of ambiguity and uncertainty, leading to the development of 'irrational objectivity'. In this environment, employees will deliberately omit concerns regarding potentially less optimistic outcomes to maintain their positions. This kind of behaviour is of significance to decisions because (a) the decision maker receives less or biased information and/or (b) it creates an individual incentive that deviates from the goals of the organization or project.

The second stream of pluralist research is concerned with the issue of *negotiations*. Yang and Fu (2014) highlight that failure to balance interests, or the adoption of a strongly self-interested strategy in negotiations can lead to sub-optimal negotiations, and may even impact the (perceived) success of projects. The findings are in line with Kujala et al. (2007), who suggests that satisfaction of the interests of all parties is a critical project success factor. In terms of negotiation strategies, Mullaly (2014) studies contextual influences on the choice of the strategy. He suggests that the decision maker's choice of negotiation style follows the perceived level of flexibility, defined as power-distribution and the level of explicit rules in the organization. Furthermore, in highlighting the role of own and other actor's emotions in the choice of negotiation strategies and their respective success in goal achievement, Clarke (2010) shows that negotiation strategies can be subtle.

4.3. Contextualist literature in project studies

The contextualist school uses sense making theory (Weick, 1995) to explore, e.g. how stakeholder preferences in decisions result from different interpretations of reality (Alderman and Ivory, 2011; Alderman et al., 2005; Thiry, 2001). Contextualist research is thereby, other than the pluralist school, foremost concerned with the roots of different perceptions, rather than the consequences. Other research applies sensemaking to study why and when individuals or project teams are able to abolish old and obsolete goals and methods (Musca et al., 2014), or why certain theoretically incomparable alternatives are preferred over another within somewhat homogenous groups (de Camprieu et al., 2007). While research in the other two schools focussed on decisions that 'have gone wrong', the contextualist literature also discusses projects that are considered successful, such as Pitsis et al.'s (2003) analysis of the Sydney Harbour project, Musca et al.'s (2014) case study of a successful project turnaround, or Alderman and Ivory's (2011) discussion of the Eden project. For these cases, the authors have illustrated how shared or converging narratives of the key actors contribute to successful project implementation. Drivers that foster the convergence were e.g. creation of a shared vision among the stakeholders (Alderman and Ivory, 2011; Pitsis et al., 2003), or a process of constant dialoguing to co-construct the project renewal among the project team (Musca et al., 2014).

Due to the qualitative approach taken by the contextualist school, the decision problems studied are less specific than in the other two schools. Most contextualist research rather illustrates a management approach that enables more effective or more convergent everyday project decisions. This provides a process view rather than an analysis of the decision as an isolated event (see also Table 5). These authors argue, that a lack of converging narratives or a failure of the individual actors to 'make sense' of the project situation may lead to conflict, misunderstanding and mistrust, withdrawals from stakeholders in the decision process, and blame-culture, which challenges decisions. Building on actor-network-theory, Alderman and Ivory (2011) stress that the convergence is not only related to a convergence of interest ('political convergence') but is essentially also about a convergence of sense making ('cognitive convergence'), i.e. the development of a shared vision and common understanding of the meaning of the project. Moreover, Thiry argues that a lack of sensemaking '*will trigger individual's anchoring into existing paradigms and confrontations*' (Thiry 2001, p. 71). Consequently, the studied or proposed management approaches focus on steering the sense making process, where the project manager's task becomes the *"'management of meaning' by providing 'interpretative frameworks'"* (Alderman et al. 2005, p. 384). Such concepts are for instance the Future Perfect Strategy approach described by Pitsis et al. (2003) or the managing of the sensemaking process in value management practice as presented by Thiry (2001).

Musca et al. (2014) analysed the role of the sensemaking process in the case of a successful project turnaround in a mountaineering expedition. While reductionist literature discusses the problem of non-abolishment of obsolete goals (see e.g. Sengupta et al., 2008), Musca et al. identified processes and drivers that led to the development of new goals and approaches, like rewording and reframing of the problem, or a focus of attention to less ambiguous issues.

As the concept of 'bias' and 'error' is irrelevant to the Contextualist literature, they offer no 'de-biasing' strategies, or systematic solutions to 'improve' decision behaviour. Recommendations to practice of the contextualist research thus concern creation of shared vision among project actors, and the soft skills of the project manager as orchestrator of the sensemaking process who has to 'surf the waves of meaning' (Weick, 1995).

Table 5
Overview on contextualist research school.

	Research problem	Theoretical basis	Methodology
(Alderman et al., 2005)	Conflict, mistrust and misunderstandings between stakeholders	• competing narratives	Case study—Pendolino train Interviews with key actors (snowball sampling; unspecified number) and inter-company workshops
(Alderman and Ivory, 2011)	Conflicts, misunderstanding, ignorance of problems and risks	• actor-network-theory • sensemaking	Multi-case study—Millenium Dome, Eden Project, Heathrow Terminal 5, Scottish Parliament Building Document review, existing case studies, press reports, and transcripts of government committee hearings.
(de Camprieu et al., 2007)	Different prioritization of risk types leading to misunderstandings	• cultural dimensions	Survey (quantitative) 138 students from China (72) and Canada (66) enrolled in similar Masters programme on PM
(Fellows and Liu, 2015)	Conflict, mistrust and misunderstandings between stakeholders from different cultures	• sensemaking • cultural schemas (Hofstede model)	Literature review
(Lenfle, 2011)	Dealing with uncertainty	• learning • implicit: sensemaking	Longitudinal case study—Manhattan Project Document review, existing case studies in academic publications
(Musca et al., 2014)	Reluctance of abolishing established goals/approaches	• sensemaking	Ethnography—"Darwin" mountaineering expedition Observation of discussions, document review (expedition log)
(Pitsis et al., 2003)	Creation of a common vision for the future	• narrative creation • future perfect strategizing	Ethnography—Sydney Harbour Project Observation of project meetings, media review, review of PR material, document review (reports of independent assessor)
(Thiry, 2001)	Common prioritization of values among stakeholders	• sensemaking	Conceptual article

4.4. Literature drawing from different schools

19 out of 55 of the reviewed articles drew from a combination of various schools (see Table 6). Typically, these publications explore 'broader' issues and problems in projects and make explicit or implicit use of theories from different schools to explore different alternative or complementary explanations, and to add more explanatory depth to the phenomena studied. Issues that are researched in the 'mixed-school' literature are escalation of commitment or non-termination of failing projects (e.g. Van Oorschot et al., 2013; Winch, 2013), 'sub-optimal' plan decisions (e.g. Pinto, 2013; Williams and Samset, 2010; Winch and Kelsey, 2005), ineffective risk management (e.g. Kutsch and Hall, 2005, 2010), and the failure to identify or react to early warning signs (e.g. Haji-Kazemi et al., 2015; Williams et al., 2012). Two of the articles (Brewer and Runeson, 2009; Müller et al., 2009) discussed specific influences (attitude, culture) on decision, and reflected on these influences from—not specifically addressed—different theoretical angles.

The phenomena of *Escalation of commitment* (EoC) have received attention from both strictly reductionist literature and mixed approaches. The oldest publication in our sample, Drummond's (1999) analysis of the Taurus case, discusses several of the drivers of EoC, that in later publications were explored with more theoretical rigour: e.g. socio-psychological biases, '*first order thinking*' prohibiting problem reframing ('more of the same'), or politically motivated decisions. While Drummond's article has introduced a wide array of potential issues, these are presented as alternative explanations with little theoretical discussion, and they are not thoroughly brought together. More recent analyses of EoC have taken a more analytical approach integrating various theoretical concepts. Winch (2013) proposes a three-stage model in which future perfect strategizing fosters an environment that triggers strategic misrepresentation which further drives EoC. He especially stresses that, considered out of context, strategic misrepresentation is a 'puzzle' for which the motive is unclear. By contextualizing it through an environment of future perfect strategizing, he identifies a motive and root for strategic misrepresentation. Other procedural views of the escalation phenomena are brought forward by Alvarez et al. (2011) and Van Oorschot et al. (2013). Both explore EoC as a process (ref. Alvarez et al.: '*escalation of commitment is better understood as coming with sequential, parallel loosely coupled sub-processes*', p. 983), thus following a contextualist tradition of analysis. However, to explore the process, both articles introduce a variety of theories from other schools. In Alvarez et al. analysis of a disastrous mountaineering expedition, they discuss a series of determinants that, by themselves, do not represent a 'single point of failure' but '*lock actors in an escalating situation*'. These determinants are both drawn from the reductionist school (self-justification, ego implications, self-efficacy bias), and from the pluralistic school (face-saving behaviour, high strategic stakes). Van Oorschot et al.'s (2013) analysis of EoC in a new product development project in the automotive industry, explicitly acknowledges the limited explanatory power of common (single school) theories, like groupthink or sunk cost bias. Consequently, they introduce a procedural decision model ('*decision trap*'), which embodies various perceptive filters based

Table 6
Overview on literature drawing from different schools ((R) = Reductionist; (P) = Pluralist; (C) = Contextualist).

	Research problem	Theoretical basis	Methodology
(Alvarez et al., 2011)	Escalation of commitment	• organizing-based narrative process view (C) • competitive rivalry (C) • cognitive biases (self-efficacy, re-inforcement, optimism bias,..) (R)	Case study—1996 Mount Everest expedition Document review of survivors' accounts and prior academic case studies
(Boddy and Paton, 2004)	Tension between stakeholders resulting in confusing, contradicting, or withheld information	• narratives (C) • bounded rationality (R) • cognitive biases (R) • strategic misrepresentation (P)	Comparative multi-case study (Pensco; London Stock Exchange—Taurus; Sun. Microsystems) Prior academic case studies
(Brewer and Runeson, 2009)	Attitude driven decisions	• opportunistic decision criteria (P) • value perception (R)	Two stage study (doctoral thesis): (1) Delphi study, (2) interviews (1) 13 international construction industry experts; (2) 39 decision makers in the architecture/engineering/construction industry (clients, contractors, subcontractors, consultants)
(Drummond, 1999)	Escalation of commitment	• sensemaking (C) implicitly addressed • opportunistic behaviour (P) • cognitive biases (R)	Case study—London Stock Exchange "Taurus" Media review, document review (internal reports, memoranda, etc.), interviews with project team members
(Flyvbjerg, 2006)	Sub-optimal plan decisions	• strategic misrepresentation (P) • optimism bias (R)	Conceptual article (Overview of potential drivers for overoptimistic forecasts and introduction of reference class forecasting)
(Haji-Kazemi et al., 2015)	Failure to identify or respond to early warning signs	• optimism bias (R) • opportunistic behaviour (P)	Cross-sectional survey (inductive reasoning; exploratory and explanatory); 86 PMs, members of "Project Norway" association
(Havermans et al., 2015)	Prioritization of groups and solution following leader's narrative	• narratives (C) • power distribution (P) • linguistics (C)	Semi-structured interviews 11 practitioners at different hierarchy levels, working with various types of (novel) projects and programmes
(Kutsch and Hall, 2005, 2010)	Ineffective risk management system	• Taboo (P) • Distrust (P) • sensemaking (C) and cognitive biases (R) implicitly addressed	In-depth interviews 18 IT practitioners
(Lefley, 2006)	Influence of project champions on project selection	• Optimism bias (R) • Strategic misrepresentation (P)	Case study—Introduction of a new IT communication system at the Association of International Accountants Comparison of results of different appraisal methods (FAP model protocol, Delphi model, Group discussion model)
(Müller et al., 2009)	Decision making processes and styles	• Cultural influences—no explicit link to behavioural decision theories made	Sequential multi-method (interviews, survey) 12 interviews, 60 surveys of project practitioners (Germany and Sweden) with experiences with both German and Swedish projects
(Ojansivu and Alajoutsijärvi, 2015)	Intergroup tensions in project	• Narratives (time concept, C) • Politics, stereotyping (P)	Comparative case study—Service-intensive projects: (A) wind turbine parts supplier, (B) content management system supplier; 49 interviews with informants on the customer and contractor side
(Van Oorschot et al., 2013)	Failure to terminate	• Sensemaking (C) • Bounded rationality (R) • Illusion of control (C) • Various cognitive biases (R)	Ethnography—New Product Development project of a supplier to the automotive industry (semiconductor manufacturing) Observation of 29 core team meetings, document review of general internal information, discussion with involved strategic consultant
(Pinto, 2013)	Sub-optimal plan decisions	• Optimism bias (R) • Strategic misrepresentation (P) • Sensemaking (C)	Conceptual article (Overview of potential explanations)
(Sanderson, 2012)	Megaproject performance	• bounded rationality (R) • opportunistic behaviour (P) • narratives (C)	Conceptual article (Overview of potential explanations)

Table 6 (*continued*)

	Research problem	Theoretical basis	Methodology
(Williams et al., 2012)	Failure to adopt responses to early warning signs	• optimism bias (R) • groupthink (R) • purposeful overlooking (P) • power dynamics (P) • sensemaking (C)	(1) Semi-structured interviews and document review; (2) case studies Review of 9 (public and private) governance frameworks (interviews with 14 project practitioners); 8 cross-sectoral case studies; Norway, UK and Australia
(Williams and Samset, 2010)	Sub-optimal plan decisions	• framing (C) • groupthink (R) • strategic misrepresentation (P) • bounded rationality (R)	Conceptual article (Overview of potential explanations)
(Winch, 2013)	Escalation of commitment	• future perfect strategizing (C) • strategic misrepresentation (P)	Case study—Channel Fixed Link Hindsight analysis based on media clippings and official reports.
(Winch and Kelsey, 2005)	Sub-optimal plan decisions	• heuristics (R) • negotiation (P) • organizational learning (C)	In-depth interviews 18 construction project professionals; UK
(Zhang et al., 2011)	Risk management	• sensemaking (C) • risk perception, cognitive biases (R)	Literature review

on theories of the reductionist school. In their model, these filters serve as drivers of the sensemaking process within the project team.

Another intriguing illustration on how the theoretical concepts of the different schools can be complementary to each other are the case studies presented by Boddy and Paton (2004) in their discussion of competing narratives. In their paper, Boddy and Paton discuss various roots that lead to competing or converging narratives—and thus to perceived project success or failure. These roots are linked to a broad range of theoretical concepts, among other cognitive biases, bounded rationality, political interest, or the cultural and structural context.

While the papers presented above take a process view in which different theoretical models are considered as drivers of the process, other papers present alternative explanation models for observed behavioural decision making in a simple side-by-side manner. One typical example of these kinds of papers is Pinto's presentation of the 'seven deadly sins' of project management (2013), which discusses a variety of potential causes for inadequate plan decisions, drawn from all three schools—e.g. optimism bias and anchoring, 'massaging the plan' (strategic misrepresentation), or a failure of the project manager to 'orchestrate' the sensemaking process. Other such papers in which various individual explanations are presented but not discussed in their potential interaction are for instance Williams and Samset's (2010) overview on possible influences on front-end decisions, Kutsch and Hall's (2005, 2010) analysis of deliberate ignorance in the risk management process, or the studies on failure to identify and respond to early warning signs by Williams et al. (2012) or Haji-Kazemi et al. (2015).

It could be argued that the large group of mixed-school research would compromise the utility of the proposed framework to project literature. However, the schools were still useful to qualify different types of explanations used, and point to the need of a more explicit relationship to the theoretical and philosophical foundations of the applied concepts. Moreover, the majority of the 'mixed' research does not aim at an integration of concepts but provides foremost alternative, non-complementary theoretical concepts.

While the multi-lense analyses of single issues highlight the plurality of theoretical concepts, these publications lack a systematic integration of the theories and an analysis of possible interactions. Moreover, these publications rarely acknowledge that the theories and models they discuss are based on significantly different philosophical concepts that may create conflicts and churn. This is where we see the major contribution of the proposed framework: allowing a systematic consideration, combination and integration of theoretical concepts through structured analysis. In those few cases where theoretical integration has been achieved, the findings inform our understanding the actuality of behavioural decision making in projects. We will argue this further in Section 6.

5. Implications for future research

The systematic analysis of the literature revealed eight gaps in the research of the individual schools. First, the most striking gap in the reductionist school emerges as we compare the coverage of research in behavioural decision making in projects with the grand theories at their foundation. There we identified an almost exclusive focus on the potential negative effects of cognitive biases and heuristics. However, recent literature in management studies like Bingham and Eisenhardt's (2011) study of 'simple rules' or Artinger et al.'s (2015) analysis of '*Heuristics as adaptive decision strategies in management*' have given a positive spin to the issue of heuristics. Moreover, heuristics as a fruitful tool in many practical applications, when used 'ecologically or socially rational', has been the focus of Gigerenzer and colleagues for more than two decades (Gigerenzer and Gaissmaier, 2011) and merits attention in project studies.

Second, most of the research was based on studies of failing projects. It would be relevant to explore 'pink elephants' that are successful, and understand how decision behaviour shaped project success.[1]

Third, cognitive sciences in the organizational context have developed a recent interest in the neurosciences. Such an integration of cutting edge research is currently still a white spot for behavioural decision making in projects, which would be interesting to explore, and thereby advance reductionist research.

Fourth, according to our experience, project practitioners experience political and strategic behaviour as a strong determinant in project decisions. However, the literature on that matter is, as we have shown, limited. Although we are aware of the limited research opportunities in that regard, due to the sensitivity of the topic, an increased focus of future research on political manoeuvring and power relations in projects will most likely provide interesting and enlightening findings.

Fifth, with regard to the issues explored, we have seen a strong focus on the problem of over-optimism of forecasters. However, industry practitioners have in personal communication with the authors pointed to the challenge of overcautious forecasters and project practitioners. While this phenomenon is not directly linked with highly visible cost overruns and schedule delays, we may argue that excessive caution may lead to lost opportunities and suppress innovation and therefore deserves attention in future research.

Sixth, while some literature explored external and internal influences affecting the decision maker, we found limited comparative discussion on how different behavioural decision theories interpret these influences and their potential effects on decisions.

Seventh, while research focuses on the making of decision, there is also a need to study the problem of indecisiveness, delayed decisions, or defensive decision making. Research in this area can explore, for example, why project actors may avoid decisions, the tactics used to delay decisions or cope with indecisiveness, and the impact of indecisiveness in the project process. The three different schools will provide fruitful and complementary starting points for such inquiries.

Eight, one of the findings of our literature review was that the majority of the articles in our sample draw implicitly and uncritically from different behavioural decision making schools. While such integration of different perspectives can be fruitful, the acknowledgment of their different theoretical foundations and potential incommensurability is crucial. We will discuss this issue in detail in the next section.

6. The case for research across schools

We started the article by describing the pluralism of research in behavioural decision making in projects, and the potential threat of fragmentation. Our literature review confirms our initial assumption, and suggests that the research on behavioural decision making in projects is still in a stage Knudsen (2003) called '*fragmented adhocracy*' in his discussion of pluralism in organization theory, meaning a broad variety of methodological and theoretical approaches while the interdependency among the research community is low.

Paradoxically, we found that around a third of the reviewed articles builds on various schools of behavioural decision making. However, these 'mixed' studies fit different theories and explanations often just loosely together, and lack a solid discussion of the underlying grand theories. Moreover, most of these articles did not fully acknowledge the significant onto-epistemological differences between the theories brought together. However, as Powell et al. (2011) claim concerning the schools, '*each of them can reasonably be called a paradigm*' (p. 1382). Thus, such a 'mix of theories' may potentially lead to issues of incommensurability (Scherer, 1998), particularly if not explicitly discussed.

While we acknowledge certain philosophical gaps between the paradigms that may be impossible to bridge, we do not see a case of absolute incommensurability like Burrell and Morgan (1979) argued. Instead, we follow Sage et al.'s (2014) argument, that paradigmatic incommensurability exist but is not absolute, and furthermore Scherer (1998), who claims that we '*do not consider incommensurability as a problem that exists per se, but a difficulty that emerges in a controversy between proponents of different positions*' *(p.161).*

To illustrate with a common metaphor: we are usually not facing situations like the *trompe l'oeil* in Fig. 1 where we can either see a duck *or* a rabbit—but not both simultaneously. Rather we may be blind men around an elephant—calling the tail a rope, the legs pillars, and the tusks branches of a tree while failing to perceive the whole animal. We will therefore briefly discuss the limitations and opportunities for studies across schools, by pointing to areas of possible incommensurability, and others with potential for complementary studies. Or, metaphorically: we identify the areas of ducks and rabbits, and those which are more likely to be elephants.

As already discussed in Section 4, we see a clear incommensurability between schools in the understanding of what constitutes a 'good' decisions and how it contributes to the respective concept of project success. Overcoming such incommensurability is rather unlikely and potentially unnecessary. However, identifying and analysing those differences improves our understanding of projects, how we manage and organize projects, and why. A good example is Pellegrinelli and Murray-Webster's (2011) study of onto-epistemological stances of project stakeholders and their consequences to the management of an organizational change project.

However, such a case of entirely different, mutually exclusive realities is rare within the different theories. Instead, many of the theories explore, in (unnecessary) isolation, complementary aspects of the same phenomena, like escalation of commitment or over-optimism, thus missing out on the opportunity to explore the full benefits of multi-paradigmatic research.

The multi-paradigmatic approach or pluralism of theories allows to develop '*more "comprehensive" explanation and understanding of social phenomena*' (Scherer 1998, p. 155). As

[1] We would like to thank Professor Hans-George Gemünden for suggesting the study of successful cases in prior drafts of this article.

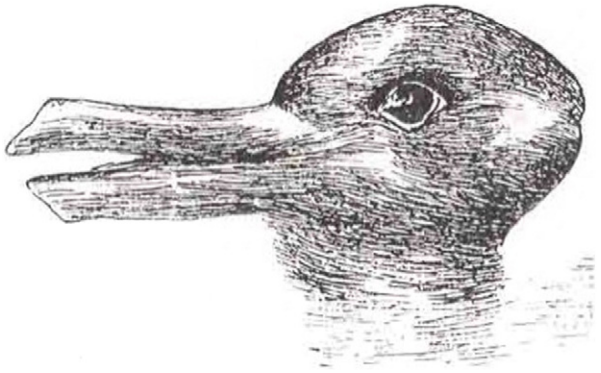

Fig. 1. Rabbit-duck illusion. Source: Jastrow, J. (1899). The mind's eye. Popular Science Monthly, 54, 299–312.

such, paradigmatic pluralism offers to map possible compatibilities (Sage et al., 2014).

We identified two articles that explicitly attempted to develop such multi-paradigmatic research based on onto-epistemological consideration. First, Sanderson (2012) offers three alternative explanations for behaviour in megaprojects, following different assumptions regarding the decision maker's cognition and view of the future, loosely associated with a reductionist view ('*misaligned and underdeveloped governance*'), pluralist view ('*strategic rent-seeking behaviour*'), and contextualist view ('*diverse project cultures and rationalities*'). While Sanderson highlights the onto-epistemological differences between the explanation types, he presents them as alternatives, not potentially complementary concepts. Second, Zhang et al. (2011) similarly illustrate how the researcher's view on risk as an objective reality or a subjective construction influences the scientific approach.

Still, when we point to these connections and contestations between the schools instead of considering them as mere alternatives, it is not the unification of theories or overcoming incommensurability that we aim for. Rather, we wish to enable reflective research that may combine the concepts in a more analytical and critical way.

Future research should therefore aim to build bridges across the current fragmentation by adopting such an informed approach, acknowledging the foundations and concepts of the different schools and actively searching for potential overlaps, while being aware of the incommensurabilities of the different streams. Thereby, we hope that the proposed framework fosters the development of what Knudsen (2003) termed a '*polycentric oligarchy*', thus escaping the '*fragmentation trap*'.

7. Conclusion & outlook

This article provides a comprehensive overview of behavioural decision making research in projects and presents a solid starting point to any researchers interested in the topic. In doing so, we address our first question, namely how behavioural decision making is studied in the project literature. In answering this question, we contribute to practice by providing an overview of how behaviours impact decisions, and the coping mechanisms offered by the literature.

Our second and third questions intended to identify gaps and links between general research on behavioural decision making and its application in project studies. We have addressed these questions by providing a structured mapping of the research against its respective underlying grand theories—thereby providing a tool for identifying gaps and missing links.

We conclude calling for research within and across the different schools, and critical consideration of incommensurabilities and complementarities across schools. We argue that the different perspectives significantly increase our understanding of behavioural decision making. The framework shall thus also serve as a "*map of possible compatibilities when addressing matters of practical [..] concern*" (Sage et al. 2014, p. 546). Through this, the article contributes to avoiding the fragmentation trap, and instead encourages fruitful interchange between theories, taking full advantage of the theoretical pluralism of the field.

This study is limited to a systematic review, which had its starting point in the main project management journals. This was the aim of the work, however, it comes with caveats, for example, other relevant research streams studying behavioural decision making in projects could be published in other outlets, and not acknowledged by project scholars. Future studies can develop literature reviews starting on aligned disciplines or in general management to locate these other streams of research. Moreover, our research covered three large areas related with behavioural decision making in projects. Therefore, we cannot enter as much in detail into each school. Future work could explore the literature within each school in more detail, or a bibliometric analysis of the schools.[2]

There are a myriad of ways to organize a literature review. Our literature review is based on a pre-established framework, which was appropriate for the objective of this study, namely to strengthen the relationship between project-based research and grand theories. However, future research could explore other alternative forms of framing the literature.

In conclusion, decisions in projects are complex and multifaceted. In consequence research has been as multifaceted, a pluralism of theories, '*letting a thousand flowers bloom*' (Knudsen 2003, p. 263). As has been argued by Söderlund and Geraldi (2012) "*the field of project management needs to foster a variety of paradigms working simultaneously, in different facets, with different theories, mindsets, epistemologies, ontologies, however being able to bridge the thinking across these communities.*" By applying the framework of the reductionist, contextualist and pluralist schools of thought, we shed light on the 'thousand blooming flowers' in behavioural decision making research in project, while building '*bridges across the communities*' for a more critical examination and exploration of the pluralism of theories.

Conflict of interest

The authors declare that there are no conflict of interest.

[2] We thank the anonymous reviewer for this suggestion.

Acknowledgements

Parts of this work have been supported by ABB (ASEA Brown Boveri) through their financial support for the main author's PhD project.

References

Alderman, N., Ivory, C., 2011. Projects: translation and convergence in projects: an organizational perspective on project success. Proj. Manag. J. 42:17–30. http://dx.doi.org/10.1002/pmj.20261.

Alderman, N., Ivory, C., McLoughlin, I., Vaughan, R., 2005. Sense-making as a process within complex service-led projects. Int. J. Proj. Manag. 23: 380–385. http://dx.doi.org/10.1016/j.ijproman.2005.01.004.

Alvarez, J.F.A., Pustina, A., Hällgren, M., 2011. Escalating commitment in the death zone: new insights from the 1996 Mount Everest disaster. Int. J. Proj. Manag. 29:971–985. http://dx.doi.org/10.1016/j.ijproman.2011.01.013.

Artinger, F., Petersen, M., Gigerenzer, G., Weibler, J., 2015. Heuristics as adaptive decision strategies in management. J. Organ. Behav. 36:33–52. http://dx.doi.org/10.1002/job.1950.

Bingham, C.B., Eisenhardt, K.M., 2011. Rational heuristics: the "simple rules" that strategists learn from process experience. Strateg. Manag. J. 32: 1437–1464. http://dx.doi.org/10.1002/smj.965.

Boddy, D., Paton, R., 2004. Responding to competing narratives: lessons for project managers. Int. J. Proj. Manag. 22:225–233. http://dx.doi.org/10.1016/j.ijproman.2003.07.001.

Brewer, G., Runeson, G., 2009. Innovation and attitude: mapping the profile of ICT decision-makers in architectural, engineering and construction firms. Int. J. Manag. Proj. Bus. 2:599–610. http://dx.doi.org/10.1108/17538370910991179.

Burrell, G., Morgan, G., 1979. Social Paradigms and Organizational Analysis: Elements of the Sociology of Corporate Life. Heinemann Educational, London.

Chapman, C.B., Ward, S.C., Harwood, I., 2006. Minimising the effects of dysfunctional corporate culture in estimation and evaluation processes: a constructively simple approach. Int. J. Proj. Manag. 24:106–115. http://dx.doi.org/10.1016/j.ijproman.2005.08.004.

Cicmil, S., Williams, T., Thomas, J., Hodgson, D., 2006. Rethinking Project Management: researching the actuality of projects. Int. J. Proj. Manag. 24: 675–686. http://dx.doi.org/10.1016/j.ijproman.2006.08.006.

Clarke, N., 2010. Projects are emotional: how project managers' emotional awareness can influence decisions and behaviours in projects. Int. J. Manag. Proj. Bus. 3:604–624. http://dx.doi.org/10.1108/17538371011076073.

Clegg, S.R., Kreiner, K., 2013. Power and Politics in Construction Projects, in: Novel Approaches to Organizational Project Management Research: Translational and Transformational. Copenhagen Business School Press, Copenhagen, pp. 268–293.

Cyert, R.M., March, J.G., 1963. A Behavioural Theory of the Firm. Prentice-Hall, Madison.

de Camprieu, R., Desbiens, J., Feixue, Y., 2007. "Cultural" differences in project risk perception: an empirical comparison of China and Canada. Int. J. Proj. Manag. 25:683–693. http://dx.doi.org/10.1016/j.ijproman.2007.07.005.

Drummond, H., 1999. Are we any closer to the end? Escalation and the case of Taurus1. Int. J. Proj. Manag. 17:11–16. http://dx.doi.org/10.1016/S0263-7863(97)00074-4.

Du, S., Keil, M., Mathiassen, L., Shen, Y., Tiwana, A., 2007. Attention-shaping tools, expertise, and perceived control in IT project risk assessment. Decis. Support. Syst. 43:269–283. http://dx.doi.org/10.1016/j.dss.2006.10.002.

Ekrot, B., Rank, J., Gemünden, H.G., 2015. Antecedents of project managers' voice behavior: the moderating effect of organization-based self-esteem and affective organizational commitment. Int. J. Proj. Manag. 1028–1042 http://dx.doi.org/10.1016/j.ijproman.2015.10.011.

Eweje, J., Turner, R., Müller, R., 2012. Maximizing strategic value from megaprojects: the influence of information-feed on decision-making by the project manager. Int. J. Proj. Manag. 30:639–651. http://dx.doi.org/10.1016/j.ijproman.2012.01.004.

Fellows, R., Liu, A., 2015. Sensemaking in the cross-cultural contexts of projects. Int. J. Proj. Manag. 246–257 http://dx.doi.org/10.1016/j.ijproman.2015.03.010.

Flyvbjerg, B., 2006. From Nobel Prize to project management: getting risks right. Proj. Manag. J. 37:5–15. http://dx.doi.org/10.1002/smj.476.

Flyvbjerg, B., 2007. Policy and planning for large-infrastructure projects: problems, causes, cures. Environ. Plann. B. Plann. Des. 34:578–597. http://dx.doi.org/10.1068/b32111.

Flyvbjerg, B., 2013. Quality control and due diligence in project management: getting decisions right by taking the outside view. Int. J. Proj. Manag. 31: 760–774. http://dx.doi.org/10.1016/j.ijproman.2012.10.007.

Geraldi, J., Söderlund, J., 2016. Project studies and engaged scholarship. Int. J. Manag. Proj. Bus. 9:767–797. http://dx.doi.org/10.1108/IJMPB-02-2016-0016.

Geraldi, J., Stingl, V., 2016. From visions of grandeur to grand failure: alternative schools of descriptive decision theories to explain the Berlin Brandenburg Airport Fiasco. EURAM Conference. Paris.

Gigerenzer, G., Gaissmaier, W., 2011. Heuristic decision making. Annu. Rev. Psychol. 62:451–482. http://dx.doi.org/10.1146/annurev-psych-120709-145346.

Haji-Kazemi, S., Andersen, B., Klakegg, O.J., 2015. Barriers against effective responses to early warning signs in projects. Int. J. Proj. Manag. 33: 1068–1083. http://dx.doi.org/10.1016/j.ijproman.2015.01.002.

Hällgren, M., 2010. Groupthink in temporary organizations. Int. J. Manag. Proj. Bus. 3:94–110. http://dx.doi.org/10.1108/17538371011014044.

Hartono, B., Sulistyo, S.R., Praftiwi, P.P., Hasmoro, D., 2014. Project risk: theoretical concepts and stakeholders' perspectives. Int. J. Proj. Manag. 32: 400–411. http://dx.doi.org/10.1016/j.ijproman.2013.05.011.

Havermans, L.A., Keegan, A., Den Hartog, D.N., 2015. Choosing your words carefully: leaders' narratives of complex emergent problem resolution. Int. J. Proj. Manag. 33:973–984. http://dx.doi.org/10.1016/j.ijproman.2015.01.001.

Hazır, Ö., 2015. A review of analytical models, approaches and decision support tools in project monitoring and control. Int. J. Proj. Manag. 33: 808–815. http://dx.doi.org/10.1016/j.ijproman.2014.09.005.

Jani, A., 2008. An experimental investigation of factors influencing perceived control over a failing IT project. Int. J. Proj. Manag. 26: 726–732. http://dx.doi.org/10.1016/j.ijproman.2008.06.004.

Jani, A., 2011. Escalation of commitment in troubled IT projects: influence of project risk factors and self-efficacy on the perception of risk and the commitment to a failing project. Int. J. Proj. Manag. 29:934–945. http://dx.doi.org/10.1016/j.ijproman.2010.08.004.

Kahneman, D., Tversky, A., 1979. Prospect theory: an analysis of decision under risk. Econometrica 66:497–527. http://dx.doi.org/10.2307/1914185.

Keil, M., Tan, B.C.Y., Wei, K.-K., Saarinen, T., Tuunainen, V., Wassenaar, A., 2000. A cross-cultural study on escalation of commitment behavior in software projects. MIS Q. 24:299–325. http://dx.doi.org/10.2307/3250940.

Knudsen, C., 2003. Pluralism, scientific progress and the structure of organization theory. The Oxford Handbook of Project Management. Oxford Univeristy Press, Oxford, pp. 262–286.

Kujala, J., Murtoaro, J., Artto, K., 2007. A negotiation approach to project sales and implementation. Proj. Manag. J. 38:33–44. http://dx.doi.org/10.1002/pmj.20018.

Kutsch, E., Hall, M., 2005. Intervening conditions on the management of project risk: dealing with uncertainty in information technology projects. Int. J. Proj. Manag. 23:591–599. http://dx.doi.org/10.1016/j.ijproman.2005.06.009.

Kutsch, E., Hall, M., 2010. Deliberate ignorance in project risk management. Int. J. Proj. Manag. 28:245–255. http://dx.doi.org/10.1016/j.ijproman.2009.05.003.

Kutsch, E., Maylor, H., Weyer, B., Lupson, J., 2011. Performers, trackers, lemmings and the lost: sustained false optimism in forecasting project outcomes—evidence from a quasi-experiment. Int. J. Proj. Manag. 29: 1070–1081. http://dx.doi.org/10.1016/j.ijproman.2011.01.010.

Kwak, Y.H., Anbari, F.T., 2009. Analyzing project management research: perspectives from top management journals. Int. J. Proj. Manag. 27: 435–446. http://dx.doi.org/10.1016/j.ijproman.2008.08.004.

Lefley, F., 2006. Can a project champion bias project selection and, if so, how can we avoid it? Manag. Res. News 29:174–183. http://dx.doi.org/10.1108/01409170610665031.

Lenfle, S., 2011. The strategy of parallel approaches in projects with unforeseeable uncertainty: the Manhattan case in retrospect. Int. J. Proj. Manag. 29:359–373. http://dx.doi.org/10.1016/j.ijproman.2011.02.001.

Lewis, M.W., Grimes, A.J., 1999. Metatriangulation: building theory from multiple paradigms. Acad. Manag. Rev. 24:672–690. http://dx.doi.org/10.2307/259348.

Leybourne, S., Sadler-Smith, E., 2006. The role of intuition and improvisation in project management. Int. J. Proj. Manag. 24:483–492. http://dx.doi.org/10.1016/j.ijproman.2006.03.007.

Lovallo, D., Kahneman, D., 2003. Delusions of success: how optimism undermines executives' decisions. Harv. Bus. Rev. 81:1–7. http://dx.doi.org/10.1225/R0307D.

Low, W.W., Abdul-Rahman, H., Zakaria, N., 2015. The impact of organizational culture on international bidding decisions: Malaysia context. Int. J. Proj. Manag. 33:917–931. http://dx.doi.org/10.1016/j.ijproman.2014.10.010.

Martinsuo, M., Suomala, P., Kanniainen, J., 2013. Evaluating the organizational impact of product development projects. Int. J. Manag. Proj. Bus. 6:173–198. http://dx.doi.org/10.1108/17538371311291080.

McCray, G.E., Purvis, R.L., McCray, C.G., 2002. Project management under uncertainty the impact of heuristics and biases.pdf. Proj. Manag. J. 33, 49–57.

Meyer, W.G., 2014. The effect of optimism bias on the decision to terminate failing projects. Proj. Manag. J. 45:7–20. http://dx.doi.org/10.1002/pmj.21435.

Mullaly, M., 2014. The role of agency in project initiation decisions. Int. J. Manag. Proj. Bus. 7:518–535. http://dx.doi.org/10.1108/IJMPB-09-2013-0043.

Müller, R., Spang, K., Ozcan, S., 2009. Cultural differences in decision making in project teams. Int. J. Manag. Proj. Bus. 2:70–93. http://dx.doi.org/10.1108/17538370910930527.

Musca, G.N., Mellet, C., Simoni, G., Sitri, F., de Vogüé, S., 2014. "Drop your boat!": the discursive co-construction of project renewal. The case of the Darwin mountaineering expedition in Patagonia. Int. J. Proj. Manag. 32:1157–1169. http://dx.doi.org/10.1016/j.ijproman.2014.02.006.

Ojansivu, I., Alajoutsijärvi, K., 2015. Inside service-intensive projects: analyzing inbuilt tensions. Int. J. Proj. Manag. 33:901–916. http://dx.doi.org/10.1016/j.ijproman.2014.11.001.

Pellegrinelli, S., Murray-Webster, R., 2011. Multi-paradigmatic perspectives on a business transformation program. Proj. Manag. J. 42:4–19. http://dx.doi.org/10.1002/pmj.20275.

Pinto, J.K., 2013. Lies, damned lies, and project plans: recurring human errors that can ruin the project planning process. Bus. Horiz. 56:643–653. http://dx.doi.org/10.1016/j.bushor.2013.05.006.

Pinto, J.K., 2014. Project management, governance, and the normalization of deviance. Int. J. Proj. Manag. 32:376–387. http://dx.doi.org/10.1016/j.ijproman.2013.06.004.

Pinto, J.K., Patanakul, P., 2015. When narcissism drives project champions: a review and research agenda. Int. J. Proj. Manag. 33:1180–1190. http://dx.doi.org/10.1016/j.ijproman.2015.01.013.

Pitsis, T.S., Clegg, S.R., Marosszeky, M., Rura-Polley, T., 2003. Constructing the Olympic dream: a future perfect strategy of project management. Organ. Sci. 14:574–590. http://dx.doi.org/10.1287/orsc.14.5.574.16762.

Powell, T.C., Lovallo, D., Fox, C.R., 2011. Behavioral strategy. Strateg. Manag. J. 32:1369–1386. http://dx.doi.org/10.1002/smj.968.

Ross, J., Staw, B.M., 1993. Organizational escalation and exit: lessons from the Shoreham nuclear power plant. Acad. Manag. J. 36:701–732. http://dx.doi.org/10.2307/256756.

Sage, D., Dainty, A., Brookes, N., 2014. A critical argument in favor of theoretical pluralism: project failure and the many and varied limitations of project management. Int. J. Proj. Manag. 32:544–555. http://dx.doi.org/10.1016/j.ijproman.2013.08.005.

Sanderson, J., 2012. Risk, uncertainty and governance in megaprojects: a critical discussion of alternative explanations. Int. J. Proj. Manag. 30:432–443. http://dx.doi.org/10.1016/j.ijproman.2011.11.002.

Scherer, A.G., 1998. Pluralism and incommensurability in strategic management and organization theory: a problem in search of a solution. Organization 5:147–168. http://dx.doi.org/10.1177/135050849852001.

Sengupta, K., Abdel-Hamid, T.K., Van Wassenhove, L.N., 2008. The experience trap. Harv. Bus. Rev. 86, 94–101 (doi:Article).

Shapira, A., Laufer, A., Shenhar, A.J., 1994. Anatomy of decision making in project planning teams. Int. J. Proj. Manag. 12:172–182. http://dx.doi.org/10.1016/0263-7863(94)90033-7.

Shmueli, O., Pliskin, N., Fink, L., 2015. Explaining over-requirement in software development projects: an experimental investigation of behavioral effects. Int. J. Proj. Manag. 33:380–394. http://dx.doi.org/10.1016/j.ijproman.2014.07.003.

Shore, B., 2008. Systematic biases and culture in project failures. Proj. Manag. J. 39:5–16. http://dx.doi.org/10.1002/pmj.20082.

Simon, H., 1982. Models of Bounded Rationality, in: Vol. 1: Economic Analysis and Public Policy. Behavioural Economics and Business Organization vol. 2. MIT Press, Cambridge, MA.

Slovic, P., 1987. Perception of risk. Science (80-.) 236:280–285. http://dx.doi.org/10.1126/science.3563507.

Söderlund, J., 2011. Pluralism in Project Management: navigating the crossroads of specialization and fragmentation. Int. J. Manag. Rev. 13:153–176. http://dx.doi.org/10.1111/j.1468-2370.2010.00290.x.

Söderlund, J., Geraldi, J., 2012. Classics in project management revisiting the past, creating the future. Int. J. Manag. Proj. Bus. 5:559–577. http://dx.doi.org/10.1108/17538371211280245.

Son, J., Rojas, E.M., 2011. Impact of optimism bias regarding organizational dynamics on project planning and control. J. Constr. Eng. Manag. 137:147–157. http://dx.doi.org/10.1061/(ASCE)CO.1943-7862.0000260.

Thiry, M., 2001. Sensemaking in value management practice. Int. J. Proj. Manag. 19:71–77. http://dx.doi.org/10.1016/S0263-7863(00)00023-5.

Tranfield, D., Denyer, D., Smart, P., 2003. Towards a methodology for developing evidence-informed management knowledge by means of systematic review *. Br. J. Manag. 14:207–222. http://dx.doi.org/10.1111/1467-8551.00375.

Treasury, H., 2004. Supplementary Green Book Guidance: Optimism Bias. HM Treasury, London.

Van Oorschot, K.E., Akkermans, H., Sengupta, K., Van Wassenhove, L.N., 2013. Anatomy of a decision trap in complex new product development projects. Acad. Manag. J. 56:285–307. http://dx.doi.org/10.5465/amj.2010.0742.

Weick, K.E., 1995. Sensemaking in Organizations. SAGE Publications, Thousand Oaks.

Williams, T., Samset, K., 2010. Issues in front-end decision making on projects. Proj. Manag. J. 43:84–100. http://dx.doi.org/10.1002/pmj.

Williams, T., Jonny Klakegg, O., Walker, D.H.T., Andersen, B., Morten Magnussen, O., 2012. Identifying and acting on early warning signs in complex projects. Proj. Manag. J. 43:37–53. http://dx.doi.org/10.1002/pmj.21259.

Winch, G.M., 2013. Escalation in major projects: lessons from the channel fixed link. Int. J. Proj. Manag. 31:724–734. http://dx.doi.org/10.1016/j.ijproman.2013.01.012.

Winch, G.M., Kelsey, J., 2005. What do construction project planners do? Int. J. Proj. Manag. 23:141–149. http://dx.doi.org/10.1016/j.ijproman.2004.06.002.

Winter, M., Smith, C., Morris, P., Cicmil, S., 2006. Directions for future research in project management: the main findings of a UK government-funded research network. Int. J. Proj. Manag. 24:638–649. http://dx.doi.org/10.1016/j.ijproman.2006.08.009.

Yang, S., Fu, L., 2014. Critical chain and evidence reasoning applied to multi-project resource schedule in automobile R&D process. Int. J. Proj. Manag. 32:166–177. http://dx.doi.org/10.1016/j.ijproman.2013.01.010.

Yang, R.J., Wang, Y., Jin, X.-H., Herazo, B., Lizarralde, G., Paquin, R., 2014. Stakeholders' attributes, behaviors, and decision-making strategies in construction projects: importance and correlations in practice. Proj. Manag. J. 45:74–90. http://dx.doi.org/10.1002/pmj.

Zahra, S.A., Newey, L.R., 2009. Maximizing the impact of organization science: theory-building at the intersection of disciplines and/or fields. J. Manag. Stud. 46:1059–1075. http://dx.doi.org/10.1111/j.1467-6486.2009.00848.x.

Zhang, H., Herazo, B., Lizarralde, G., Paquin, R., 2011. Two schools of risk analysis: a review of past research on project risk. Proj. Manag. J. 42:5–18. http://dx.doi.org/10.1002/pmj.