

Analyzing safety strategies at the front-end of projects

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ABSTRACT: Project front-end definition is the process for conceptual development of projects that involve the development of sufficient strategic information on which project owners can address risk and make decisions to commit resources in order to maximize the potential for success. An up-front underestimation of costs might result in inferior projects being selected and thus affect the strategic performance of projects. Known causes for underestimation of costs include underestimating risk, overestimating opportunities, inadequate estimation methods and skills, reliance on weak information and strategic / deliberate scope creep. In this conceptual paper we identify common challenges in project and risk governance and argue how methodology used for project front-end definition can be applied toward these challenges. We further discuss how safety strategies in project based organizations should be analyzed in recognition of these challenges.

1 INTRODUCTION

Both practitioners and risk governance scholars stress the need to pay attention to the legal, economic, social and institutional contexts in which risks are managed (Hermans et al., 2012). There is also an increased emphasis on research addressing risk related decision-making in settings where many stakeholders are involved and where these different stakeholders hold diverse meanings on the concept of risk (Renn & Graham, 2005, Aven, 2011).

We argue that the increasing projectification of firms and society (Midler, 1995, Packendorff & Lindgren, 2014) contribute to increase the frequency and complexity of these institutional, multi-stakeholder contexts. Projectification is considered as a change in organizational and governance structure to increase the primacy of the processes of projects within a central organization and its supply networks (Maylor et al., 2006). We advocate that a good understanding of these “projectification processes” and their potential consequences is highly relevant for understanding almost any aspect of contemporary risk governance in project based organizations (PBOs). We will use the term PBO to refer to both the project-based part of an otherwise process-oriented organization and organizations that organize most of their internal and external activities in projects (Muller, et al. 2014).

The dominant understanding of risk has been as a combination of probabilities and consequences (Hafver et al., 2015). Aven & Renn (2009a) present and discuss alternative perspectives on risk and in Aven & Renn (2009b) they discuss the role of quantitative risk assessments for characterizing risk and uncertainty and delineating appropriate risk management options. They propose to define risk as “uncertainty about and severity of the consequences (or outcomes) of an activity with respect to something that humans value” (Aven & Renn, 2009b). IRGC (2009) emphasize that successful risk management requires setting an objective, designing a strategy to reach the objective, and planning and acting to implement this strategy. We recognize that the notion of safety strategies warrant further elaboration and a discussion. However, for now we define a safety strategy as “the method or plan by which an organization intends to accomplish its safety and reliability objectives”.

Project risk management is one of 10 project management knowledge areas (PMBOK, 2013). PMBOK (2013) define risk as “an uncertain event or condition that, if it occurs, has a positive or negative effect on one or more project objectives”. We acknowledge the rich discourse on the nature of risk and uncertainty in both safety and project management literature, both tracing back to 1921 (Knight, 1921, Keynes, 1921), however this is not the main focus in this paper. For the purpose of this paper we will consider risk as the result of uncertainty on (project) objectives, ref. ISO Guide 73 / ISO 31000.

We argue that an upfront process for clear and logical definition of (project) objectives and a structured qualitative analysis can provide us with a process for analyzing safety strategies against known risk governance deficits.

There are many accounts about both successful and failed projects; however defining a successful project is not always straightforward. Within research addressing project success factors there is a wide agreement about the importance of the project definition, i.e. the project front-end, for the project success (Samset, 2010). We will use the term “efficiency” as a reference to project management success and project tactical performance. When addressing project success and project strategic performance we will use the term “effectiveness” (Miller et al., 2001).

The term “front-end phase of projects” is not new of age. The US decision to undertake the International Space Station (ISS) project, at that time named “Space Station Freedom”, in their FY 1985 US budget committed the project to a detailed front-end definition effort over the first three years (Brunner & Byerly, 1990). The term is also similar to the idea of “quality at entry” used by the World Bank (WorldBank, 1996). The current interest in the front-end phase of project has, like much of the contemporary project research, been driven by questions like; “Why have the considerable study and improvements in project management not eliminated project failures?” Similar questions related to safety research could be: “Why have the considerable study and improvements in risk and safety research not eliminated accidents?” We will not revisit these discourses in any detail but they provide the basis for our research questions (RQ) and discussions in this paper.

RQ1. What are the common governance challenges for project and risk management in PBOs?

RQ2. How can methodology for project front-end definition support the analysis of safety strategies in PBOs?

We first aim to conceptualize the project front-end phase in the context of PBOs. Then we try to further frame the social and institutional contexts of the project front-end phase. After identifying and comparing known challenges from project governance with some known challenges from risk governance we continue to discuss how methodology for project front-end definition can support the development of safety strategies.

The research is of importance for future studies, as it provides a conceptualization of the project front-end phase, which can serve as a basis for operationalization and measurement in future empirical studies, which will help PBO’s to adjust their organizational context and approach to both project and risk governance.

2 LITERATURE

To better understand the social and institutional contexts of the project front-end phase (Figure 1) we will briefly define and discuss the concept of governance and two aspects that we consider relevant to our research questions; governance in the perspective of projects and governance in the realm of safety and reliability, i.e. risk governance. We will also introduce the concept of governmentality. We do not aim to be exhaustive and the selected references are based on “convenient sampling” from relevant project and risk management literature.

2.1 *The front-end of projects*

A project is defined as a temporary endeavor undertaken to create a unique product of service (PMBOK, 2013). Projects are a form of organization developed to manage efforts with high uncertainty. Project front-end definition, i.e. project governance, uses systematic methodologies and rational / logical processes to address the phase of projects where the uncertainty is at its highest and cost of efforts to address the uncertainties are lowest (Figure 1). For most people project management is an execution oriented discipline with focus on the application of knowledge, skills, tools, and techniques to meet project requirements (PMBOK, 2013). Edkins et al. (2013) addresses some of the questions that arise from such view on project management, e.g. who defines the requirements? They also introduce the question and discussion on what is, and should, the role of project management be in these early formative stages, i.e. the front-end, of a project. There is limited project management literature focusing on the project front-end phase (Andersen et al., 2016). Kim & Wilemon (2002) use the adjective “fuzzy” to describe this phase. Williams & Samset (2010) define it as “all activities from the time the idea is conceived, until the final decision to finance the project is made”.

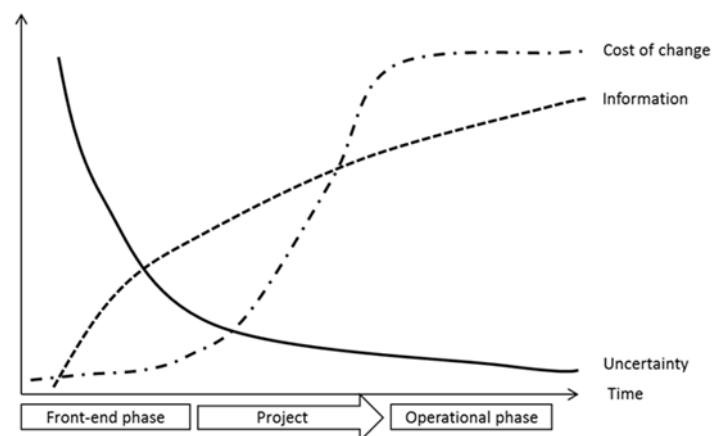


Figure 1. Illustration of uncertainty, the available information and cost of change during the project life cycle. Illustration is based on Samset (2010) p.21.

The nature of the work done in the front-end phase is usually quite different from the commonly formal and execution focused work during project implementation phase. Edkins et al. (2013) describe the work in the front-end to have much greater horizons, e.g. in intellectual terms, in view of time, types of personalities involved and type of data surveys, than that typically found downstream in the project implementation. Williams & Samset (2010) describe the ethos of project front-end to be about “doing the right project” while the project implementation phase, and the core of the project management discipline, is about “doing the project right”.

The main focus of this paper is not project management, it's on risk governance. However, we argue that similar question for risk management also arises in the PBO's; who identifies the risks, and how? Who define the (project) safety strategy?

2.2 Governance

The term governance is used to describe the multitude of actors and processes that lead to collectively binding decisions (Renn et al., 2011). The notion of governance started to spread in the 1980 and saw a highpoint in propagation with the 2001 White Paper of the European Commission on governance (European Commission, 2000). The governance perspective are by many considered as a response to globalization and the emerging complexity of policy issues, drawing attention to the diversity of actors, the diversity of their roles and the manifold relationships between them. Hermans et al. (2012) and Renn et al. (2011) reflect on the most important scientific approaches and disciplines that have contributed to the emergence of risk governance. They also give a good introduction to the broader governance turn in policy sciences as well as its etymological origin. The notion governance is used both in a descriptive and in a normative sense (Renn et al., 2011). Hermans et al. (2012) discuss if it is a model (normative) or an idea used to describe the current state of affairs (descriptive). Van Asselt & Renn (2011) conclude that in the context of risk it's used as both, i.e. a hybrid of an analytical frame and a normative model.

Ahola et al. (2014) examine project governance literature and contrast it to general governance literature published outside the domain of project research. Based on their findings they argue that there exists considerable potential to further bridging of the project governance literature and general governance literature. It is interesting to note that when comparing the references of Ahola et al. (2014) with those of Renn et al. (2011) and Hermans et al. (2012) there is no overlap in the use of references to the broader, general notion of governance when, respectively, addressing the origins of project governance and risk governance.

This illustrates the comprehensive scope and multi-disciplinary nature of the concept of governance. For the purpose of our discussions we will use a combination of definitions used by Stoker (1998) and Pemsel et al. (2014). “The concept of governance is in essence the emphasis on mechanisms for administering (Stoker, 1998) and can be seen as a combination of processes, responsibilities and mechanisms to identify and reach a set of goals (Pemsel et al., 2014)”. Van Asselt & Renn (2011) highlight that some authors differentiate between horizontal and vertical governance.

2.3 Governance in the perspective of projects

To give a picture of the social and institutional challenges facing managers in the front-end phase of projects we address forms of governance that affect projects in this phase. We will shortly define/discuss; corporate governance, the governance of projects and project governance.

Corporate governance is the system by which business corporations are directed and controlled (OECD, 2004, Demise, 2006). This includes processes put in place to shape and pursue a corporation's objectives in the context of its social and regulatory frameworks and the market environment. The governance of projects and project governance collectively refer to governance of portfolios, programs, projects and project management, all which coexist within the corporate governance framework (Müller et al., 2014). Project governance refers to the governance of individual projects while governance of projects refers to the governance of a group of projects, e.g. within a program or portfolio of projects. PMBOK (2013) define project governance as “an oversight function that is aligned with the organization's governance model and that encompasses the project life-cycle [by providing] a comprehensive, consistent method of controlling the project and ensuring its success by defining and documenting and communicating reliable, repeatable project practices”. However, the concept of project governance remains ambiguous in the project management field (Ahola et al., 2014).

We briefly described a hierarchy with three levels of governance that is applicable to the front-end of projects. We will later introduce governmentality as something that represents an organization's governance culture, i.e. the major constituent of its social framework.

2.4 Governance in the realm of safety & reliability

The theme governance in the realm of safety and reliability may for some be too wide and inaccurate. For the purpose of this paper we will delineate the discussion to risk governance.

Van Asselt & Renn (2011) define risk governance as “the various ways in which many actors, individuals, and institutions, public and private, deal with risks surrounded by uncertainty, complexity and/or ambiguity”. The International Risk Governance Council (IRGC, 2010) defines risk governance as “the identification, assessment, management and communication of risks in a broad context. It includes the totality of actors, rules, conventions, processes and mechanisms concerned with how relevant risk information is collected, analyzed and communicated, and how and by whom risk management decisions are taken”.

Hermans et al. (2012) and Renn et al. (2011) reflect on the most important scientific approaches and disciplines that have contributed to the emergence of risk governance. It is not the scope of the paper to add to or reiterate this discourse. However, we find it relevant for our research question to recapitulate two main risk paradigms.

The Knightian view sharply distinguish risk from uncertainty (Knight, 1921) i.e. risk can be explained as “you don’t know for sure what will happen, but you know the odds,” while uncertainty means that “you don’t even know the odds”. Thus, Knightian uncertainty is immeasurable and not calculable (Hermans et al., 2012). In contrast the Keynesian view do not distinguish risk from uncertainty and he claimed that life is dominated by uncertainty, not probability (Keynes, 1921). Keynes (1921) argues that if life would obey to the laws of probability, humans would have no choices and no influence on the course of events. Risk governance is by many regarded as inherited from the Keynesian view on uncertainty and risk (Hermans et al., 2012).

The notion of risk governance is that it’s a hybrid of an analytical frame and a normative model (Van Asselt & Renn, 2011). Further, that “the body of knowledge provides a theoretically demanding, and empirically sound basis to argue that many risks cannot be calculated on the basis of probability and effects alone and that regulatory models which build on that assumption are not just inadequate” (Renn et al., 2011).

“Risk governance deficits are deficiencies or failures in the identification, assessment, management or communication of risk”. IRGC (2009) identified 23 deficits, 10 related to the assessment and understanding of risk (cluster A) and 13 related to the management of risk (cluster B).

Aven (2011) provide some important reflections on the meaning and validity of these deficits and identified some problems that relate to the fundamental understanding of risk and risk assessment, as well as risk management. However, the clear recommendations remain that organizations and their processes need to develop appropriate strategies to mitigate these known risk governance deficits.

2.5 Governmentality

The term governmentality is a merger of the words governance and mentality and is used to address different approaches (mentalities) to the task of governance. The concept of governmentality, defined as the art and task of governance, was first developed by the French philosopher Michel Foucault (1926-1984). Project management researchers have addressed governmentality in form of the suitability and limitations of neo-liberal, outcome and behavior controlled governmentality in large scale construction projects (Clegg et al., 2002) and in terms of project governance paradigms (Müller et al., 2014). Governmentality appears as an alternative to policing, litigation and arbitration, especially in situations where there are multiple actors and interests (Clegg et al., 2002). It would be relevant and interesting to discuss and compare the concept of governmentality with the literature on safety culture; however with respect to the need to scope this paper, we will leave that discussion to later.

2.6 Safety strategies

So much has been written about “strategy” that the word has lost much of its distinctive meaning. As such the term safety strategies may for some practitioners and many risk management academics be too inaccurate to have practical use. However, we perceive the core purpose of risk governance to be the notion of increased safety and reliability and this, consequently, form the basis for our use of the term. Loebbaka & Lewis (2009) state that a Safety Management System (SMS) should be created as a mean for ensuring that an organization is capable of achieving and maintaining acceptable standards of safety performance. The notion is that an effective SMS strategy will eliminate workplace hazards, manage acceptable levels of risk, promote workers’ wellness, create competitive advantage, and improve financial performance (Loebbaka & Lewis, 2009). According to Choo (2002) a SMS strategy is divided into three stages: 1. sense making of the organization’s safety environment; 2. the formation of safety issues and knowledge gaps; and 3. decision making resulting in actions. Thomas Krause (Krause, 2005) identifies further steps that support considerations of the long-term implications of all strategic decisions.

Safety strategy is a well-used term within automation companies, both to machine manufacturers and machine users. It is also commonly used within the health sector e.g. UK have their own health and safety system strategy program. There are a large number of scientific papers describing patient safety strategies. However, a quick literature search reveals that the term safety strategy is not commonly used or clearly defined within the risk management or project management literature.

3 STRATEGIES TOWARDS PARADOXES AND DEFICITS

This section addresses common challenges in projects and risk governance by identifying known paradoxes from governance in the realm of projects (Samset & Volden, 2016) and known deficits within risk governance (IRGC, 2009). Table 1 summarizes the findings in nine common challenges and the corresponding strategies we propose. We will further elaborate two important aspects of these known challenges and the proposed strategies; tactical vs. strategic success and selecting the right concept. It is not possible to detail the methodology used for project front-end definitions in this paper. We refer to Samset (2010) for a comprehensive introduction. Thus, we do not claim any novelty regarding the methodology referred in the following discussions.

3.1 *Tactical vs. strategic success*

Tactical performance is a measure of efficiency, e.g. how inputs are converted into outputs. In the case of projects it's measured in terms of cost, timing and quality of deliverables. Strategic performance is the measures of effectiveness, e.g. a question of how the output performs after they have been delivered. Individuals and institutions, and in specific public media, have an inclination to emphasize the tactical performance when judging if a project or risk is managed in a successful manner. The case of asbestos provides a prime example (Aven, 2011).

Samset & Volden (2016) provide examples of projects that by media was judged as a failure due to delays and cost overruns, despite that the cost overruns only represented a few months of operations cost of the completed hospital. Another large construction project where the infrastructure was never put in use due to changed political and technological reality did not receive much negative attention in the media or public, evidently, because the project was completed on time and on budget. Clearly, the successful management of a risk or a project should also be viable in the sense that the intended long-term benefits are realized.

Safety strategies should comprise requirements and evaluation criteria related to relevance, impact and sustainability, in addition to efficiency and effectiveness. These can be rather challenging requirements that go beyond the issues that usually are covered by risk analysts, planners, decision-makers and media. However, applied as standard requirements both up-front and during ex-post evaluations they would be likely to improve risk governance, as we know it today, considerably.

3.2 *Selecting the right concept*

The up-front selection of conceptual solution without sufficient systematical scrutinizing alternative opportunities is a common challenge within both risk and project governance. With “conceptual solution” we mean much more than just the technical solution — it includes the entire business case, all of the various organizations involved, and the various mechanisms and arrangements involved in the inter-organizational relationships. A study by Samset & Volden (2016) of 17 large construction projects show that that the final choice of concept is determined more by decision makers than by analysts, and will often be the result of policy and preferences more than objective reasoning. It is also known that risk management failures often arise when decision-makers have neglected an entire set of risk management options, such as those that aim to build redundancies and resilience into systems that might be exposed to unknown or uncertain threats (IRGC, 2009).

Safety strategies need to emphasize systematic up-front analysis of problems and needs rather than specific solutions, e.g. the solution to a traffic capacity issue should not automatically be increased capacity. Concepts should always address the core problem, i.e. address the cause for increased traffic. Safety strategies should be vigilant toward “path dependency” and ensure that standardized or systematically preferences for solutions, and the avoidance of others, do not conflict with logical and rational choices. Regardless of the nature of the risk the selection of concepts for mitigation and control should be analyzed against explicit, measurable effectiveness goal. Successfully definition of sound objectives and corresponding concepts to fulfill them provides a good basis for healthy risk governance.

4 DISCUSSION

We have found support in the literature that the legal, economic, social and institutional contexts of PBO's provide complex challenges that cannot be sufficiently addressed by traditional project management (PMBOK, 2013) alone, we need project governance (Müller et al., 2014, Samset & Volden, 2016). Similarly, the risk governance body of knowledge provides a sound basis to argue that many risks cannot be calculated on the basis of probability and effects alone (Renn et al., 2011, Aven, 2011, IRGC, 2009). Based on this we identified nine common challenges in project and risk governance and proposed nine initiatives to address these challenges (Table 1). Thus, both project and risk managers in PBO's could use a similar “checklist” to make sure that the strategies they are implementing do not build on inadequate assumptions.

Table 1. Identifying strategies towards common challenges in project and risk governance. The risk governance deficits are based on and linked to the two clusters (A and B) of 23 deficits identified by IRGC (2009).

Paradoxes of project governance (Samset & Volden, 2016)	Deficits of risk governance (IRGC, 2009, Aven, 2011)	Safety strategy
Success is more often measured in terms of tactical performance (efficiency) rather than strategic performance (effectiveness).	Inability to reconcile the (long) time-frame of the risk issue with pressure and incentives towards visible, short-term results or cost (B7), e.g. technical risk are mitigated at the cost of operational performance.	Apply up-front, in addition to efficiency and effectiveness, requirements and evaluation criteria related to relevance, impact and sustainability.
Less resources are used up front to identify the best conceptual solution, than to improve tactical performance during project implementation.	Less resources are used for assessing risk up-front (A1, A2) than managing and mitigation of risk during implementation and operation (B2).	Emphasize systematic up-front analysis of problems and needs rather than specific solutions.
Decisions are based on masses of detailed information up front rather than carefully selected facts and judgmental information relevant to highlight the essential issues.	Decisions are based on up-front quantitative risk assessments calculated from large datasets rather than robust qualitative uncertainty assessments with focus on risk tolerability/ acceptability (Aven, 2011).	Avoid "analysis paralysis". Focus on the type of information that is needed, not the volume. Consider the "half-life" of information.
The choice of conceptual solution is made without systematically scrutinizing the opportunity space up front.	Not all reasonable, available options are necessarily considered (B3) before a plan of action is decided upon.	Avoid "path dependency". Ensure that standardized or systematic preferences for solutions (and avoidance of others) don't conflict with logical / rational choices.
Strategy and alignment of objectives are highlighted as essential concerns, but in most cases the internal logic of causalities and the probabilities of realization are erroneous.	Failure to design effective risk management strategies (B2) or failures in either implementation or enforcement (B5) could have unintended secondary impacts (B6), e.g. strategy becoming a hierarchy of goals that are erroneous interlinked (or decoupled) in cause-and-effect chains.	Link objectives to needs. Avoid complex statements. Use objectives that can be measured by single parameters. Build a hierarchy of goals that are interlinked in realistic and logical cause-and-effect chains.
The focus is on the final cost estimate (the budget), while early cost estimates are overlooked.	Not conducting appropriate (early) analyses to assess the costs and benefits (efficiency) of various options and how these are distributed (B4).	Ensure traceability of early cost estimates vs. budgeted cost. Implement incentives for providing early accurate cost estimates (vs. final budget).
Detailed estimation of cost and benefits is commonly done up front, but disregarded by decision-makers, who tend to emphasize other aspects.	Up-front cost assessment of risk strategies are commonly disregarded if one fail to gather information about risk attitude, risk acceptance and risk appetite of decision-makers (A3) and stakeholders (A5).	Emphasize up-front stakeholder analyses and engagement that both identify and advocate information decision-makers may not find useful or credible.
The tendency is to choose a "predict-and-provide" strategy rather than explore alternative solutions.	Inappropriate use of formal models to create and understand knowledge about complex systems (A9).	Never define needs as a solution, e.g. as an increase of capacity. Analyze the problem when defining goals and objectives, don't focus on the solutions.
Long-term viability is the intention but the planning horizon is too short, resulting in sub-optimal choices that one will regret later.	Inability to reconcile the time-frame of the risk issue with pressure and incentives towards visible, short-term results or cost (B7).	Don't trust extrapolation. Use both quantitative and qualitative approaches. Think creatively about possible future scenarios.

The nature of the work done in the front-end phase is usually found to be quite different from the commonly formal and execution focused work during project implementation phase. It can be argued that the different nature of the work performed in project front-end and project implementation also apply to risk assessment and risk management, respectively. Work with front-end definitions and risk assessments appear to be best characterized by a Keynesian world view. While project and risk management more often than not are driven by scientific disciplines such as engineering and economics and imprinted with a stronger Knightian world view. We would argue that some of the paradoxes from project governance and deficits in risk governance may be born from this difference in work philosophies.

The preference towards use of large datasets for quantitative analyses over focused qualitative analyses is a common challenge in risk and project governance. Safety strategies should be careful about using extrapolation based on quantitative data and focus on the type of information that is needed, not the volume. Challenges related to the half-life of information also need careful consideration, i.e. how long is the information valid. Data with quick changes, like marked and consumer behavior, make poor basis for selecting safety strategies.

Most organizations with focus on safety and reliability have implemented the use of SMS. Although, this is something positive one should take caution, having SMS do not automatically constitute having a sound safety strategy. However, the clear recommendations remain that organizations should implement SMS and tailor their processes in line with appropriate strategies to mitigate the known risk governance deficits.

We argue that a healthy governance perspective is needed to sensibly examine and explain the dynamics around issues framed as risk issues and their mitigation/management in PBO's. Van Asselt and Renn, 2011 highlight that some authors differentiate between horizontal and vertical governance (Lyll & Tait, 2005). Although, not fully in line with these definitions we argue that a corporation or organization represent a horizontal segment of decision-making processes. We also propose further discussion on how governance in the realms of projects may justify a further separation for projects as a horizontal segment of decision-making processes. Which, in turn raise questions on the need for vertical governance to connect the projects and their risks to corporations and society as a whole (and vice versa).

Thus, we propose the hypothesis that failed alignment of "the layers of horizontal governance" and missing "vertical governance" is common de-

nominators for why "projects fail" and "accidents happen".

We have proposed how the use of methodologies for project front-end definition can guide the development of the safety strategies that support the alignment of different "layers" of governance in BPO's that is needed to avoid the known deficiencies in risk governance.

5 CONCLUSIONS

The paper addresses the common challenges for risk and project governance in the management of uncertainty, and the accompanying risk, in the front-end phase of projects. By exploring methodology for project front-end definition we propose safety strategies that can help mitigate known risk governance deficits (IRGC, 2009, Aven 2011).

The introduction and conceptualization of the project front-end phase can serve as a basis for operationalization and measurement in future empirical studies of the repercussions of projectification on safety strategies, for PBO's in specific, but also for organizations and society in general.

Our limited literature review and the convenient sampling of references limit our possibility to provide any firm conclusions. However, we do consider the research and our findings to encourage further studies and to be of importance for future studies into the nature of PBO's and how their organizational context impact their safety strategies, i.e. their risk governance.

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