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Are safety and operational effectiveness contradictory requirements: The roles of routines and relational coordination

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ABSTRACT

The relationship between managing a production system to be safe and managing it to be operationally effective is often described in conflicting terms, creating confusion for research and practice. Some view improving safety as separate and distinct from increasing operational effectiveness; they are contradictory requirements. Others emphasize that safety and effectiveness are complementary, and combine to enhance competitiveness. Recent research proposes that this confusion can be explained by examining the operational and safety routines used in production. Specifically, when an organization chooses to manage safety and operations in a coordinated fashion using a joint management system, safety and operational effectiveness are complementary. Yet, the contradiction between safety and operations can occur when the functions are managed as separate and unequal silos. This research tests this supposition using the theory of relational coordination. The results, based on a combination of survey and archival safety data from 198 manufacturing firms, show that safety and operational outcomes are indirectly related via routines and that plants that manage safety and operations using a joint management system make these priorities complementary and do not create trade-offs between safety and operational performance.

One of the most enduring discourses in management revolves around how managers and organizations think about and respond to multiple, often-contradictory demands. For instance, Burns and Stalker's (1961) seminal work suggesting that organizations should respond to different environmental demands with different structures provides a foundation for the theory surrounding relational bureaucracy (Gittell and Douglass, 2012). Similarly, the role of trade-offs in operations strategy was introduced into the operations management literature by Skinner (1969), and is still debated today; for instance in discussions of "Does it pay to be green or sustainable" (Golicic and Smith, 2013).

This discourse has progressed along two interrelated trajectories. The first trajectory is more prevalent in the operations management community, where the issue of competing demands or trade-offs has mostly been addressed from a *do they exist* perspective (Ferdows and De Meyer, 1990; Rosenzweig and Easton, 2010). The second trajectory explores how managers and organizations respond to potentially competing demands. Research on ambivalence (Ashforth et al., 2014) focuses on situations where managers have competing perspectives on the same "object" and has started to examine how an individual manager deals with this potential disconnect. Similarly, research on paradox (Smith and Lewis, 2011) and ambidexterity (Birkinshaw and Gupta, 2013) examines how organizations respond to the tension that is created when they face competing demands. These discussions use a variety of terms to define and explore overlapping constructs (Ashforth et al., 2014; Smith and Lewis, 2011), though generally at the individual (ambivalence) or organizational (ambidexterity) level of analysis, rather than the operational level.

Our manuscript contributes to this debate by examining two potentially competing goals for operating a production system, namely being safe and being operationally effective (Brown, 1996; Pagell et al., 2014; Zohar, 2002). We examine these potentially contradictory priorities, or goals not by asking if there are trade-offs, but rather by exploring if the management of the production system determines if these priorities are complementary or contradictory. Thus, we propose that organizational choices regarding routines used in production determine the degree to which trade-offs occur. In so doing we make contributions to our understanding of socially sustainable operations, as well as

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the wider literature on organizational responses to contradictory demands.

Safety and operations management share a focus on developing routines that allow for the stable operation of production systems. In addition, both fields occupy a shared space with most safety management systems and research focused on operational workers and settings (Pagell et al., 2014). Safety management is focused on managing the same workers in the same production system as operations management. Therefore, it has been argued that that safety should be treated as a fundamental operational priority (Brown et al., 2000; Lo et al., 2014; Pagell et al., 2014). Yet the fields have mainly evolved along separate paths leaving researchers and managers with a conundrum when it comes to determining if the priorities to operate a system to be safe and operationally effective (e.g., low cost, high quality, etc.) are complementary or contradictory.

A stable system provides long-term effectiveness and robustness against unwanted variability (Farjoun, 2010). For safety management, stability means running a production system with no accidents, injuries or work-induced illnesses. For operations management, stability means producing the requisite good or service with no quality defects, late deliveries or cost overruns. In this research we explore stability from both the safety and operational perspectives simultaneously. A stable system would have no unwanted variance in safety or operations; it would be safe and operationally effective.

The relationship between managing this shared space to be safe and managing it to be effective is not well understood. There are well-developed streams of research that suggest that the pursuit of operational effectiveness puts workers at increased risk of accidents, stress and illness (e.g., Westgaard and Winkel, 2011). In these streams of research, operating a system to be safe and operating a system to be effective are contradictory. However, there is a developing stream of research that suggests that safety and effectiveness are complementary (e.g., Das et al., 2008).

There is evidence for both perspectives, but this evidence is not conclusive because there is very little research that simultaneously captures operational and safety outcomes (Das et al., 2008; Neumann and Dul, 2010). Instead, stability tends to be addressed from either the perspective of are the workers safe or is production effective, but rarely from the wider perspective of is the system stable; both safe and effective, addressed in this research.

It is also possible that the relationship between being safe and effective is a function of the routines used to manage the production system. Both the safety and operations literatures promulgate specific bundles of routines such as continuous improvement to create a stable production system. Some authors have concluded that these routines can be managed as a single integrated or joint management system (e.g., Granerud and Rocha, 2011; Pagell et al., 2014). This stream of research proposes that when safety and operations are jointly managed the system is stable, allowing for safe and effective production. However, the tension between safety and operations occurs when the functions are managed as separate and unequal silos or when both are managed poorly.

Smith and Lewis (2011) note that when potentially contradictory priorities exist, managerial choices can determine if tension is created between these priorities. However, tension need not result. We propose that when management responds to the potential trade-off between being safe and effective with a joint management system (JMS) for safety and operations, there is no tension between being safe and being effective and the system is stable. However, when management responds with separate and unequal management systems for safety and operations, they create tension between being safe and being effective resulting in instability.

We follow Pagell et al. (2014) and define a joint management system as a formal set of routines that allow for the shared planning, measurement, monitoring and continuous improvement of both safety and operations. Specifically, we test the proposition that in plants with a JMS safety and effectiveness are complementary priorities, while in plants that do not have a JMS safety and effectiveness are contradictory priorities.

The manuscript uses two primary theoretical perspectives. The theory of routines (Parmigiani and Howard-Grenville, 2011) helps to describe how the management of safety and operations will be understood and performed by operational and safety managers as well as the operational workforce. And the theory of relational coordination (Gittell, 2002) is used predict how a JMS would enhance stability by ensuring that safety and operational goals are complementary, not contradictory.

1. Are safety and operations complements?

To begin, it is important to recognize that safety is broadly present in the operations literature. For example, safety failures such as accidents and illness have much in common with quality defects in manufacturing (e.g., Das et al., 2008), and in some service settings it is difficult to separate safety failures from quality failures (e.g., Tucker, 2004). However, much of the operations management research on safety is not concerned with preventing harm to the workforce, but rather customers and outputs. For instance, patient safety is often an indicator of quality in studies of health care services (e.g., McFadden et al., 2009; Tucker, 2004). Similarly, unsafe products may harm their users, but the focus in these studies is generally on the integrity of the product (e.g., Marucheck et al., 2011). In these examples, the terminology may be similar, but worker safety is not directly addressed. Thus, the debate that this manuscript explores concerns the safety of operational workers, which is often unrelated to either customer or product safety.

1.1. Being safe and effective are contradictory

A variety of studies in multiple fields outside of operations conclude that safety and operational effectiveness are contradictory priorities (e.g., Brenner et al., 2004; Hasle et al., 2012; Lewchuk et al., 2001; Zohar, 2002). Brown et al. (2000:448) note that, ". . .in many industrial settings employees find themselves torn between compliance with safety rules and support of production quotas". The conclusion is reached in multiple interrelated ways. From a general organizational perspective, various authors have noted that many of the tenets of "best" operational practice also increase complexity and create tighter couplings between elements of the production system. And as complexity and coupling increases, the risk of serious unanticipated accidents also increases (Perrow, 1984).

This is exemplified in the literature on the impact of lean production on workers. Lean, with its basic philosophy to remove slack from a system to make it more effective, has been repeatedly linked to improvements in operational performance (Shah and Ward, 2003) and decreases in worker well being (Hasle et al., 2012; Lewchuk et al., 2001). Removing slack increases coupling, which can increase injuries and harm workers' health (Perrow, 1984).

Lean practices, along with other routines used to improve production system effectiveness (Westgaard and Winkel, 2011), also might harm worker well-being indirectly by creating role overload (Mclain, 1995). From a worker's perspective the removal of slack is the removal of time to accomplish tasks. As production systems become more efficient, less time is available for workers to complete their tasks, and workers can feel pressure to take shortcuts on safety to meet production quotas or even to protect their jobs (e.g., Brown et al., 2000; Mclain, 1995). There is then a well-developed literature that predicts that the pursuit of operational effectiveness increases the odds of safety failures due to either increased