Putting into practice error management theory: Unlearning and learning to manage action errors in construction

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ABSTRACT

Error management theory is drawn upon to examine how a project-based organization, which took the form of a program alliance, was able to change its established error prevention mindset to one that enacted a learning mindfulness that provided an avenue to curtail its action errors. The program alliance was required to unlearn its existing routines and beliefs to accommodate the practices required to embrace error management. As a result of establishing an error management culture the program alliance was able to create a collective mindfulness that nurtured learning and supported innovation. The findings provide a much-needed context to demonstrate the relevance of error management theory to effectively address rework and safety problems in construction projects. The robust theoretical underpinning that is grounded in practice and presented in this paper provides a mechanism to engender learning from errors, which can be utilized by construction organizations to improve the productivity and performance of their projects.

1. Introduction

A prudent man foresees the difficulties ahead and prepares for them; the simpleton goes blindly on and suffers the consequences.”

Proverbs 22:3

Within construction, errors have a negative influence on the quality and safety performance of projects (Love et al., 2004; Wanberg et al., 2013). For example, a lack of quality workmanship often follows a deviation from a standard or protocol. Consequently, this requires additional work (i.e. rework) to ensure it conforms to specified standards. When such additional work is undertaken, it has been revealed that the likelihood of a safety event occurring significantly increases (Love et al., 2015a). The corollary being the suggestion that a symbiotic relationship exists between quality and safety performance (Husin and Adnan, 2008; Wanberg et al., 2013; Love et al., 2015a,b). Both rework and safety incidents are issues that the construction industry has been trying to tackle for decades, but with limited avail. Contributing to this lack of success has been the absence of a theoretical underpinning that can be applied to redress the issues associated with rework and safety incidents (Love et al., 2016a). With this in mind, error management theory is drawn upon to examine why and how a project-based organization, which took the form of a program alliance, was able to significantly reduce and contain its errors. In doing so, the program alliance embarked on a task of rejuvenating itself through a metamorphosis that was engendered by unlearning. This enabled the alliance to simultaneously improve its quality and safety performance, and cultivate a mindfulness that enabled people to improvise and effectively handle its errors.

The research presented in this paper provides a much-needed context to demonstrate the relevance of error management theory to effectively address rework and safety problems in construction. In addition, the insights and experiences derived from the case study provide learning opportunities for organizations that are seeking to improve their quality and safety performance of the projects that they are charged with delivering.

2. Error management

Errors are difficult to define (Van Dyck et al., 2005). Reason (1990) suggests that the study of error is largely an inductive mode of enquiry, and does not demand precise axioms and definitions at the outset, as do the deductive sciences. The ambiguity surrounding the meaning of an error led Hollnagel (1993) to state “most authors wisely refrain from giving a clear definition” (p. 5). Putting aside this equivocality, it is generally assumed that human error manifests itself when something is done that is “not intended by the actor; not desired by a set of rules or
an external observer; or that led the task or system outside its accep-
table limits” (Senders and Moray, 1991: p.25). In essence, an error is a
deviation from intention, expectation or desirability. Human actions
can fail to achieve their goal in two different ways (Reason, 1990; 
Hollnagel, 1993): (1) the actions can go as planned, but the plan can be in-
adequate, which can result in mistakes; (2) or, the plan can be sa-
tisfactory, but the performance can be deficient, which can lead to slips 
and lapses occurring. A detailed review of ‘what errors are and what 
they are not’ can be found in Gold et al. (2014, 2016).

Errors have been typically deemed to be indicators of poor per-
formance and negligence (Mangels et al., 2006). When errors materialize, 
there is a natural reaction to apportion blame and engage in hindsight bias. 
Moreover, the fear of being caught for making errors can result in 
people hiding them when they occur. A negative mind-set is created toward 
not like to be seen making an error and therefore the tendency is for an 
error prevention approach to be adopted. Love and Smith (2016) have 
suggested that many construction organizations have been prone to 
adopting an error prevention strategy as they typically hide and do not 
accept to undertaking rework, despite it adversely impacting their 
bottom-line. Nonetheless, it must be recognized that errors, which 
contribute to rework, are ubiquitous and cannot be prevented. Ac-
cordingly, Frese and Keith (2015) state “errors cannot be completely 
prevented; the cognitive apparatus of humans is made for error-prone 
heuristic processing and not for potentially error-free algorithmic pro-
cessing” (p.665).

2.1. Unlearning and learning

Organizational learning has been positively linked to a construction organization’s performance (Wong and Lam, 2012) and project perfor-
formance (Wong and Cheung, 2008). A plethora of definitions for or-
ganizational learning abound in the normative literature; it is, however, 
basically “a process of embedding and applying knowledge, integrated by 
individuals and directed toward organizational success” (Wong and Lam, 2012: p.1203). Many construction organizations do not have the 
capability to learn (Wong and Lam, 2012). Therefore, if learning cannot 
be accommodated in their existing routines, their ability to initiate the 
behavioral changes that are often needed to generate performance and productivity improvement, can be thwarted (Akgün et al., 2006).

When learning does occur in construction organizations, it is gen-
erally single-looped (SL) (Dikmen et al., 2005; Wong et al., 2009); er-
rors are recognized and corrected to ensure the anticipated outcomes. In contrast to SL, double-loop learning (DL) requires a revision of the 
fundamental assumptions and actions after undertaking a comprehen-
sive review of root causes of errors. For a construction organization, DL 
is required when error management is fully embraced. A pre-condition to 
implementing error management is unlearning old routines and be-
liefs so new ones can be adopted. Through a process of ‘unlearning’, the 
mind-set of the organization can be modified to accommodate the belief 
that the existence of errors can stimulate learning and the sharing of 
knowledge about their occurrences. However, a construction organi-
zation must have a legitimate reason for switching from error preven-
tion to an error management focus (Akgün et al., 2006). Accordingly, 
Carmeli and Schaubroeck (2008) state that the unlearning process can 
be triggered when an organization’s basic assumptions are challenged by 
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