

Academy of Management Discoveries

Special Issue: Errors in Organizations: Exploring New Frontiers, and Developing New Opportunities for Theory, Research and Impact

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Overview

Today's headlines are filled with news about errors that produce service interruptions, product failures, injuries, and loss of human lives. Consider the manufacturing errors that led to massive Toyota and Samsung Galaxy Note 7 recalls, the medical errors that are responsible for thousands of deaths in U.S. hospitals each year, or the human errors that contributed to the self-driving Tesla car crash, BP's oil spill in the Gulf of Mexico, the Fukushima disaster, or the recent train derailment in Washington state. Errors are ubiquitous not only in various aspects of organizational life, but also in the economy, the environment, and in public policy. The wisdom of managing and learning from errors is incontrovertible.

Errors in organizations are defined as unintended and potentially avoidable deviations from organizationally-specified goals and standards that can yield either adverse or positive organizational consequences (Frese & Keith, 2015; Hofmann & Frese, 2011; Lei, Naveh, & Novikov, 2016). First explored by pioneering organizational scholars in the 1980s, the study of errors in organizations has experienced rapid growth over the past two decades. For example, there is an edited book on coping with errors in organizations (Hofmann & Frese, 2011), three major literature reviews on error research (Goodman, Ramanujam, Carroll, Edmondson, Hofmann, & Sutcliffe, 2011; Frese & Keith, 2015; Lei et al., 2016), and a recent theoretical summary about learning from errors and failures (Dahlin, Chuang, & Roulet, 2018).

Although increasing attention to errors in organizations seems to be well-placed and echoed by recent advances in the error literature (Frese & Keith, 2015; Hofmann & Frese, 2011; Lei et al., 2016), organizations still consistently miss the mark in effectively coping with errors and learning from them. As a result, and not surprisingly, errors still threaten human lives, business success, and environmental quality. Moreover, looking across the full range of empirical error research, a great deal of insight has been gained into the "*what*" questions, such as the nature,

antecedents, and consequences of errors (see Frese & Keith, 2015; Lei et al. 2016). However, the "how" (e.g., new relationships, feedback loops of error-related factors), "where and when" (e.g., new boundary conditions, contexts), and/or "why" (new causal logics, processes, mechanisms of error processes) questions about preventing, managing, and learning from errors in organizations remain largely unanswered (Lei et al., 2016).

Our goal is not to lament current research challenges and ask why error research dwells on the periphery of the field and why organizations remain unable to achieve a breakthrough in mitigating errors. Rather, our hope is to open up or broaden current thinking on errors and learning, to explore, surface and explain new, emerging, surprising issues related to errors, and to build a body of knowledge that is more visible, inspectable, systematic, and influential on theory and practice. To accelerate progress toward achieving this goal, we are editing this special issue on "Errors in Organizations: New Research Evidence, Frontiers, and Opportunities for Impact," with the aim of redirecting and reenergizing error theories through new empirical work on a wider array of phenomena.

In the spirit of the *Academy of Management Discoveries*' mission "to promote exploratory empirical research of management and organizational phenomena that our theories do not adequately explain," we aim to stimulate cutting-edge empirical research that develops a deeper understanding of errors in organizations and that provides broader implications for organizations and society. We invite phenomenon-driven research that identifies and explores emerging issues and surprising relationships in the error context, provides a plausible explanation as to when and why such relationships occur, highlights new boundary conditions, helps to illuminate some promising paths for the integration of diverse disciplinary backgrounds and organizational and industrial contexts, and may even overturn basic underlying assumptions. By looking at all types of errors, including both major and mundane, considering individual, group, and organizational dynamics, and shedding light on the boundary conditions potentially governing these dynamics, we strive to develop the groundwork for more innovative theorizing and more effective practice aimed at preventing errors, improving safety and quality, and saving resources and lives.

The Shifting Organizational Landscape: Challenges and Opportunities for Error Research

In many ways, the organizational landscape has changed significantly in the past 20 years. The increasing complexity, dynamism, and interconnectedness of contemporary business environments, coupled with increasing technological advancements, mean that many organizations face unexpected errors in arenas that did not exist when much of the influential error research was conducted in lab experiments and simple work tasks. Specifically, we identify the following trends that present challenges and opportunities for error research in organizations.

First, errors occur ever more frequently than expected in various organizations, and their consequences are profound and severe. The idea that errors are a recurring fact of organizational life has gained much popularity and even seems obvious. Many organizations invest considerable resources in developing and implementing a variety of error elimination and quality improvement programs. Nevertheless, only few organizations become experts at mitigating errors and learning from them. Consider reoccurring massive recalls of cars by

leading car manufacturers, such as that of 800,000 Honda Odyssey minivans recently announced. Toyota and Samsung are among the large corporations that have recently suffered prominent errors. The number of preventable deaths from medical errors in American hospitals remains high, with recent estimates suggesting more than 250,000 per year (Makary & Daniel, 2016), despite the Institute of Medicine's blockbuster report that estimated up to 98,000 preventable deaths per year (Donaldson, Corrigan, & Kohn, 2000). There is broad agreement that medical errors occur too frequently and are too costly. Some health care policymakers, administrators, caregivers, and researchers believe that the medical error problem stems from a lack of commitment to patient safety or insufficient implementation of error elimination and quality assurance practices. We, however, challenge this reasoning and suggest that lack of organizational goodwill or the existence of implementation difficulties are not sufficient explanations of the problem. Rather, it is our knowledge about errors and the processes leading to them that is not sufficient.

Second, as technological innovations, especially artificial intelligence and machine learning, become more powerful, a new need emerges to understand errors better in order to account for what smart algorithms know — or what they don't know. An important recent technological breakthrough is artificial intelligence (AI), particularly machine learning (ML). ML refers to “the machine's ability to keep improving its performance without humans having to explain exactly how to accomplish all the tasks the machine is given” (Brynjolfsson & McAfee, 2017). The ML algorithms that have achieved much of this success rely on an approach called *deep learning* that uses neural networks to learn from examples and structured feedback, training themselves to solve problems on their own (Brynjolfsson & McAfee, 2017).

Companies as diverse as Google, Walmart, UPS, and Uber have leveraged ML technology to create profitable new business models; similarly, government agencies such as the CIA, the NSA, and the military have taken advantage of the practical applications of such technology that make it possible to perform enormous calculations beyond the reach of human capability (Kuang, 2017). As such, experts foresee that “the effects of machine learning will be magnified in the coming decade”, which will, in turn, transform the core processes and business models in manufacturing, retailing, transportation, finance, health care, law, advertising, insurance, entertainment, education, and virtually every other industry (Brynjolfsson & McAfee, 2017).

AI and ML present new risks and challenges. In particular, ML systems often have low “interpretability,” meaning that we humans have difficulty peeking inside the black box and figuring out how exactly the systems reach their decisions (Rochlin, 1997). Low interpretability creates at least three kinds of risks that arise from active and/or latent errors. First, the machines may learn and replicate hidden biases, derived not from any intent of the human designer but from the data provided to train the system. For instance, if a system learns which job applicants to accept for an interview by using a data set of decisions made by human recruiters in the past, it may inadvertently learn to perpetuate their racial, gender, ethnic, or other biases. Second, a fixed hierarchy of priorities can make it difficult, if not impossible, for the system to make these priorities work in all cases — especially in situations that weren't represented in the training data. As such, an error in prioritization may be detrimental. Finally, when the ML system does make errors, as it almost inevitably will, diagnosing and correcting exactly what's going wrong can be difficult. The underlying structure of deep neural nets, masses of data, and a tangled web

of inferences can be unimaginably complex. Detecting, managing, and learning from deep latent errors may be especially challenging.

The impressive achievements and fundamental risks fueled by AI and ML outlined above, present new challenges and opportunities for error research in organizations. For example, to what extent can our knowledge about errors in organizations improve the accuracy of deep neural networks? How do we use error research to identify latent errors deeply embedded in complex networks and to reduce both active and latent errors in ML? Also, importantly, can deep neural networks of AI or ML, and related big data, inform and advance our error theory in organizations? We believe linking error theory and these frontier technologies may offer new and productive directions.

Third, as contemporary business environments become more volatile, uncertain, complex, and ambiguous (VUCA), organizations must cope with simultaneously contradictory requirements between error-free performance and other priorities. For example, organizational employees are largely expected to execute error-free activities that require precision, rule compliance, and standardization; they are also encouraged to think positively about errors, or even to actively practice error handling as part of organizational learning and innovation. In this vein, the Samsung Galaxy Note 7 phone problem emerged partly from the company's overzealous insistence on speed and internal pressures to outdo rivals (Mozur, 2017). There are many instances where speed overrules quality, and rapid success can create a culture that stifles learning: concerns and warning signs are discounted or dismissed, and errors are not managed or learned from until it is too late (Lei, 2018). As a timely response to this challenge of balancing contradictory or competing priorities, we call for additional error studies that examine the ways in which multifaceted forces or priorities interact with each other to dynamically influence the emergence and evolution of errors in organizations.

Integrating Knowledge and Bridging Gaps

For the special issue, the phenomenon of errors should be central to the papers rather than serve as their backdrop. Papers should not only highlight what is "known" (e.g., insights, research findings) and what is "needed" (e.g., gaps, blind spots) in current research and organizational practice, but also use empirical exploration to surface and describe phenomena that are "unknown" (e.g., critical anomalies and discrepant findings) and offer empirically driven insights into "the nature of relations between constructs, the mechanisms underlying that relationship, and/or the conditions governing such relations" (Bamberger, 2018:5). Below we identify three main gaps in our current knowledge about errors in organizations that beg for more attention and investigation, although other gaps are also of interest.

First, multiple recent advances on errors in organizations have largely progressed in isolation from each other; a lack of cross-fertilization between different insights from distinct approaches to errors raises inconsistent or even contradictory views and practices. For example, whereas error prevention approaches view errors as negative and seek to avoid them at all costs, error management approaches consider errors as opportunities for learning and innovation and opt to manage and learn from them. Although scholars have long suggested that error prevention and error management should be integrated to generate desirable performance outcomes, the specific

ways to achieve such an integration in real organizational settings remains under-explored (Lei et al., 2016).

Second, current investigations of errors typically center on errors made by individuals as the level of analysis. However, errors in organizations can manifest themselves at the individual, team, or system level. Distinguishing errors by level of analysis is important yet challenging in organizational life. Consider an example: several nurses in different hospital units separately failed to carry out the required verification of the medication doses they administered; as a result, patients were harmed. These instances involved the actions of individuals and could be considered as individual errors. Yet they also might be viewed as a system error because they originated in some shared conditions in the hospital, such as the lack of a safety culture that emphasizes verification, extreme time pressure to deliver patient care (leading to nurses failing to verify the dosage), or the low political power and status of nurses who shoulder the blame. The triangulation of different levels of error (i.e., individual, team, and system) or a multi-level approach to errors in empirical research may stimulate useful research directions and offer new insights into errors.

Finally, a general lack of insight into synthesizing knowledge from multiple contexts (e.g., reliability- or innovation-driven industries, competition intensity, task complexity) is hampering progress. For example, 23 of the 51 empirical studies included in Lei et al.'s review (2016) were conducted in high-risk industries. Applying the findings from one setting (e.g., aviation, healthcare) to other settings (e.g., high technology, banking) requires researchers to identify the mechanisms that hold true across contexts and to explore the boundary conditions around those mechanisms. Moreover, cross-cultural comparisons of error antecedents, processes, and outcomes, and the underlying mechanisms explaining these effects, warrant increased attention (Gelfand, Frese, & Salmon, 2011).

Proposed Research Themes and Illustrative Questions

In light of the research gaps identified above, some of the following may be themes for research questions. The questions asked in these papers may include, but need not be limited to, the following unanswered questions and under-studied themes and illustrative topics. Compared to empirical research designed to test a priori hypotheses firmly grounded on extant theory, we invite manuscripts that address research questions that can, at best, be only partially or poorly answered on the basis of extant theory. The goal should be on surfacing patterns and relationships and narrowing the range of plausible explanations. Qualitative research can be strictly phenomenological in nature. Experimental studies should be two-tailed in nature, with follow-up experiments aimed at eliminating alternative explanations. We welcome a wide range of papers that discover and incorporate new findings, empirical methods, tools, and/or contexts - potentially integrating multiple disciplines or fields, including technological frontiers such as ML and big data.

- I. *How can we conceptualize levels of analysis to advance our understanding of errors in organizations?*

Distinguishing errors by level of analysis is important. Explaining the idiosyncratic actions of a

single individual and a pattern of errors involving multiple individuals in a team or a system requires different conceptual foci, methods, and measures. From a managerial perspective, interventions and strategies for coping with individual errors may differ from those used to deal with team and system errors. Individual errors are caused by the individual's actions alone without any participation by other individuals (Sasou & Reason, 1999). Team errors refer to those that occur when team members are engaged in collaborative and interdependent work, "most commonly a breakdown in internal team processes" (Bell & Kozlowski, 2011:119). System errors are those that occur when "multiple elements – groups, tasks, knowledge, external conditions – converge in unpredicted or unprecedented ways" (MacPhail & Edmondson, 2011:187-188).

Triangulation of the three levels of error (i.e., individual, team, and system) with the antecedents of errors across different levels (i.e., individual, team, and organizational) can be challenging but may provide a fruitful research direction for surfacing and parsing the underlying mechanisms. Examples of research questions regarding this theme are:

- What are the relationships between individual, team, and system errors?
- To what extent do the steps necessary to eliminate errors at one level differ from, or even conflict with, the same requirements at other levels?
- How does the complex interplay between different forces across multiple levels influence individual, team, and system errors respectively?
- How does error orientation at the individual, team, and organizational level separately and jointly influence error origins and error management?

II. What is the effect of conflicting demands or contradictory priorities on errors in organizations?

Errors have significant implications for organizational effectiveness and performance, but they are not the only priority in organizational life. How can organizations simultaneously avoid errors and remove the related negative consequences while promoting activities that "welcome" errors as valuable opportunities for learning? At what point can organizations achieve a balance by implementing responses to limit the consequences of errors (in the short term) while benefitting by learning from them (in the longer term)? In other words, how do actors differentiate errors that can be accepted without blame and used as learning opportunities from those that are unforgivable? To date, little attention has been focused on exploring how different priorities are coupled with each other to affect error occurrence and consequences, and on ways in which potential syntheses between these oppositions might be achieved (Katz-Navon, Naveh, & Stern, 2009). Indeed, Lei, Naveh, and Novikov (2016) identified and elaborated on several tensions between conflicting forces and orientations that cast opposing effects on error pathways in organizations. Exploratory research questions in this direction may include:

- Which priorities may compete with the error prevention priority and have a profound influence on error occurrence?
- How do organizational cultures of error aversion vs. error management differently influence error origins and outcomes?
- What is the relationship between error management and innovation? And between learning and errors?

- What are the mechanisms (e.g., mediators) through which different priorities profoundly influence error occurrence and consequences in organizations?
- What are the conditions (e.g., moderators) that may harmonize or amplify the complex effects of competing priorities on error occurrence?
- What is the role of the legal and regulatory system in balancing priorities of blame, liability, learning, and innovation?

III. How do we best integrate advances in the study of errors in organizations across different research lenses, disciplines, and contexts?

Error research has emerged and evolved from different strands of organizational practice and theory, including total quality management, learning organizations, and business process reengineering (Carroll, Hofmann, Hoyle, & Vogus, 2016). High Reliability Organizing (HRO, see Weick & Sutcliffe, 2015) and organizational mindfulness (see Sutcliffe, Vogus, & Dane, 2016) emerged recently as another set of important concepts and approaches that enrich our understanding of errors in organizations, particularly in industries that manage hazardous operations. Given the complexity and flux in management thinking, this call for papers also invites submissions of empirical contributions that may integrate different research lenses (e.g., HRO, organizational mindfulness, emotions), various disciplines (e.g., management, psychology, political science), and organizational contexts (e.g., health care, aviation, banking, retailing) to investigate new or poorly understood phenomena. Here are a few examples:

- Is there an umbrella concept that links different error approaches from different research disciplines? Under what conditions?
- What are the mechanisms underlying the error processes that hold true across contexts (e.g., aviation, health care, banking)? What are the boundary conditions in which these processes are particularly powerful?
- How do different national cultures influence error coping strategies in organizations? What are the cultural dimensions most relevant to the error phenomenon?
- What is the role of emotions in error management? In learning from errors? To what extent does a particular emotional culture – fear, guilt, or hope – play a role in those situations?

IV. How can we embrace and benefit from the frontiers of major innovations and breakthroughs in modern organizations?

Recent technological and statistical developments present error researchers with more tools than ever before for understanding error dynamics (e.g., system dynamics, cyclic relationships) over time. For example, the blossoming fields of simulation (Christianson, forthcoming) and big data computing may present fruitful areas where theory, research, and practice can combine to enhance the capacity for embedding errors and training error responses. Also, as AI and ML generate breakthroughs in so many diverse areas, we are faced with enormous amounts of data, significantly improved algorithms, and substantially more powerful computer hardware in modern organizations. We are also faced with a changing reality in which automation will replace humans in many tasks. These transformations can have a synergistic effect on one another. We can observe many organizations starting to intensively use big data and advanced

analytics, the Internet of Things (or in manufacturing, the Internet of Machines), and computer integrated manufacturing. Overall, the new technology and organizational landscapes present unconventional contexts and opportunities to explore a myriad of indigenous phenomena related to errors. Many exciting research questions emerge in this new arena:

- To what extent could new technologies such as machine learning, predictive analytics, and data mining decrease error rates? Under which conditions?
- How can we use large-scale big data, which comes from sensors, devices, video/audio recorders, networks, log files, transactional applications, web, and social media, much of it generated in real time, to boost the collection of high-quality evidence on errors in organizations?
- How can we take advantage of new analytic techniques across disciplines such as machine learning, predictive analytics and data mining to potentially uncover hidden patterns, perform more advanced analyses such as stochastic shocks and recursive and cyclical relationships, and gain new insights?
- Would a new employment reality - a reduced number of employees with greater capabilities to deal with complicated technologies - lower the number of errors in organizations? Would such a new employment reality increase certain kinds of errors? Under which conditions?

Conclusion

The time is ripe to encourage research advances that meaningfully contribute to organizational science and practice as regards to understanding, effectively coping with, and learning from errors. This special issue calls for empirical papers that specify the processes, mechanisms, and boundary conditions required to better understand various forms of errors and their consequences in organizations across contexts. It encourages research and solicits submissions that suggest new theories, identify research lacunae, and integrate different and contradictory lines of studies. Our goal is to broaden current thinking on errors and to build a knowledge resource that is more visible, inspectable, systematic, and influential on theory and organizational practice. This endeavor is even more relevant in an era of rapid technological innovations, such as artificial intelligence and machine learning.

AMD will organize a workshop for potential authors and reviewers of this special issue at the 2018 Academy of Management meeting in Chicago. Members of the guest editing team and Advisory Board will engage with potential authors about potential research topics and approaches suitable for the special issue.

Both the guest editor team and the editorial review board will be able to handle a wide range of methods from the ethnographic, to the experimental, to the quantitative. Industrial and policy leaders known for their expertise in areas of safety, high reliability, and errors are also included to help develop promising manuscripts. We have no disciplinary preference and welcome papers from management scholars, psychologists, healthcare professionals, sociologists, economists, political scientists, and data scientists, among others.

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