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COMMENTARY

Leaning on a hybrid approach: A case for Lean Six Sigma

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Given the dynamic nature of the business world, it is unsurprising that business and management practices change quicker than industrial and organizational (I-O) psychology researchers can design sound research studies to investigate management practices. For example, businesses stopped using performance evaluations (Cappelli & Tavis, 2016), gamified elements of their business (Taylor, 2011), and turned to the use of social media information (Roulin & Levashina, 2019) well before I-O researchers could provide researched-backed recommendations. Whether driven by the whims of a CEO or through an earnest attempt to effect positive change, businesses will use different practices without necessarily vetting the scientific soundness of them. This does not mean, though, that I-O psychologists should not lend their expertise to improving business practices.

In this regard, we agree with Balzer, Brodke, Kluse, and Zickar (2019) that it is important to apply data to management practices/trends, and focusing on Lean is one important area. However, we disagree with the focal article's position of concentrating primarily on Lean separately from Six Sigma for three main reasons. First, Lean and Six Sigma overlap considerably, and their differences are relatively minor. Second, combining the management styles is complementary; what one style lacks, the other balances. Finally, much of the Lean practice includes Six Sigma principles, but its implementation is not always successful. That is, practitioners are currently using a mixture of the two but are doing so unsuccessfully. Therefore, researchers should focus on the hybrid Lean Six Sigma, rather than the components, to maximize their impact on practice.

What is Six Sigma?

Whereas Balzer et al. (2019) do an excellent job explaining Lean, less is discussed regarding Six Sigma. Therefore, we begin with a cursory introduction of Six Sigma.

Motorola created Six Sigma in the 1980s as a way to reduce errors and variation within its products. Six Sigma highlights the importance of data analysis techniques and statistical methods to develop optimal business processes, such that variability among output is reduced and a 99% efficacy rate is achieved (Antony, Snee, & Hoerl, 2017). Six Sigma has been labeled a "parallel-meso" (Antony et al., 2017, p. 540) structure because it operates simultaneously at micro- (i.e., worker behavior) and macro- (i.e., organizational processes) levels (Schroeder, Linderman, Liedtke, & Choo, 2008). More specifically, Six Sigma processes utilize a combination of individual specialists, structured procedures, and output criteria (i.e., performance metrics) to achieve the aforementioned goals of reduced variability and errors (Schroeder et al., 2008).

Fundamental to the Six Sigma paradigm are the DMAIC phases: Define, Measure, Analyze, Improve, and Control (Gupta, Modgil, & Gunasekaran, in press; Schweikhart & Dembe, 2009). In the Define phase, specialists identify the relevant factors, potential problems, and expected goals of the Six Sigma initiative; this provides the scope for the rest of the DMAIC phases.

Having defined the scope of the problem, the Measure phase begins collecting data to understand the current procedures and quality of the output. Having understood the outcomes of the processes, the Analyze phase attempts to understand what procedures, processes, and/or practices might be leading to the output (i.e., root cause analysis). Having identified the root cause, the Improve phase introduces changes to the procedures and/or processes to address the root cause, therein reducing variability and errors in the output and achieving the 99% efficacy rate. Finally, the Control phase sets forth a plan and policies to ensure that the improvements made in the previous stages are maintained moving forward (Arafeh et al., 2018; Gupta et al., 2019; Oguz, Kim, Hutchinson, & Han, 2012; Schweikhart, & Dembe, 2009). Importantly, each phase of Six Sigma uses statistical techniques to guide conclusions and next steps (Gupta et al., 2019).

How are Lean and Six Sigma the same?

The aforementioned description of Six Sigma highlights the overlap of Lean and Six Sigma. For instance, both Lean and Six Sigma practices are dynamic, operating as continuous improvement systems. Furthermore, both methods seek to identify errors in processes to target them as change initiatives. Both management practices maintain a customer-oriented emphasis. Both Lean management and Six Sigma agree that businesses can be optimized by the reduction of error; the difference, though, is where to address change initiatives. Whereas Lean focuses on inefficiency in procedures, Six Sigma focuses on variability in output. Importantly, variability in output can be rooted in inefficiency, which suggests that these goals are more similar than dissimilar. Finally, management buy in and employee involvement (i.e., participative design) are central to Lean and Six Sigma management (Cherrafi, Elfezazi, Chiarini, Mokhlis, & Benhida, 2016). In short, Lean and Six Sigma share many common features, which highlights the benefits of combining both approaches. To be sure, Lean and Six Sigma do share importance differences. As is discussed next, though, these differences help address limitations of these individual processes when combined, further suggesting the benefits of studying and applying Lean and Six Sigma together.

How are Lean and Six Sigma different?

As Balzer et al. (2019) note, Lean management focuses on the reduction of waste to improve workflow (Oguz et al., 2012). As just noted above, Six Sigma focuses on the reduction of variation to improve the quality of product output (Improta, Cesarelli, Montuori, Santillo, & Triassi, 2018). Whereas Lean management identifies and removes causes of waste between process steps, Six Sigma analyzes variance within process steps to reduce variation and errors in output (Antony, 2011). Continuing, Six Sigma emphasizes analytical procedures to provide data-backed recommendations for improving procedures; Lean procedures tend to be less data-driven (Antony et al., 2017). By focusing on within-procedure variation, Six Sigma can miss between-procedural step improvements; these between-procedure steps are a main focus of Lean (George, 2002). As such, combining Lean and Six Sigma would focus management practices at reducing variation within and between process steps, using data-driven decision making, to reduce overall wasteful procedures and improve product quality.

In short, the amalgamation of Lean and Six Sigma is desirable because of their complementary aspects. Six Sigma has analytical and methodological emphases that pair well with Lean's focus on identification of wasteful processes. Using statistical backing, Six Sigma can disentangle reasons for error occurrence—a contrast to Lean management's recognition and liberation of waste with limited analysis of cause. Lean management is knowledge-based, focusing on the reduction of process steps that create waste. Lean's focus on the identification and removal of waste has potential to enhance Six Sigma's focus on the reduction of variation. Furthermore, Lean principles are

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anchored on the speed with which a product is created. The combination of speed and consistency makes the combination of Lean and Six Sigma a promising focus of research and also speaks to the popularity of Lean Six Sigma practices in organizations today.

Is Lean Six Sigma used?

Combining Lean and Six Sigma is not a novel suggestion. Indeed, the concept of Lean Six Sigma is a fairly popular management practice in use today. Harris and Fitzsimmons (2019), for example, note that "Virtually every Fortune 500 organization uses [Lean Six Sigma] to improve the way they do their work" (para 1.). Organizations such as Xerox, 3M, Hertz, the Carlsberg Group, Bank of America, Chevron, and Amazon have used Lean Six Sigma. In addition, the United States Army launched a large-scale Lean Six Sigma effort (IASSC, 2019). In addition, a simple Google search finds that training programs in Lean Six Sigma are prevalent in major universities, such as Purdue University, University of Michigan, University of Texas at Austin, Villanova University, Rutgers University, and Emory University. Finally, "one of the leading Lean research outlets" (Balzer et al., 2019, p. 221) for research on Lean and Six Sigma is a journal dedicated to the hybrid approach, *Journal of Lean Six Sigma*.

Despite the prevalence of its use, a startling number of Lean Six Sigma efforts fail because of improper implementation (Albliwi, Antony, Halim Lim, & van der Wiele, 2014). This is not surprising insofar as Lean Six Sigma is a relatively new approach (beginning around 2000), and, as Balzer et al. (2019) note about Lean, there is a limited research base from which to draw guidance for proper implementation for Lean Six Sigma. Indeed, one of the leading causes of the failure of Lean Six Sigma is poor leadership during implementation (Albliwi et al., 2014). Clearly, I-O research can contribute to improving this fast-growing business practice.

Conclusions

We agree with Balzer et al.'s (2019) call for I-O researchers to contribute their expertise to understanding the efficacy, mechanisms, and ways of improving management practices in general, and Lean procedures specifically. Given the existing overlap, the complementary nature, and current usage of Lean and Six Sigma, however, we think that researchers should focus on the combined management procedure of Lean Six Sigma. By focusing on this system, our research can directly impact practice (by focusing on how people use these practices) and contribute to two sets of management practices simultaneously. Importantly, many of the suggested areas of research presented by Balzer and colleagues would apply equally well to understanding Lean Six Sigma. For example, understanding the role of leadership in a Lean Six Sigma effort needs to be understood given the relationship between failure rates of Lean Six Sigma due to leadership issues.

Where things might differ, though, is in tackling some of the Six Sigma–specific factors that Lean does not explicitly address. For example, given the data-focused nature of Six Sigma, understanding how to improve the consumption of quantitative information to make data-based decisions is an important area of research in which I-O is already engaged (e.g., Brooks, Dalal, & Nolan, 2014; Kuncel & Rigdon, 2012; Zhang, 2018) with direct application to understanding and improving Lean Six Sigma. In short, we encourage I-O researchers to focus research efforts on improving the science behind Lean Six Sigma given the overlap of these two management practices, how little rigorous research currently exists, and the fact that Lean Six Sigma is quickly growing in popularity.

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