

## Six Sigma: Definition and underlying theory<sup>☆</sup>

Roger G. Schroeder<sup>a,\*</sup>, Kevin Linderman<sup>a,1</sup>, Charles Liedtke<sup>b,2</sup>, Adrian S. Choo<sup>c,3</sup>

<sup>a</sup> Curtis L. Carlson School of Management, University of Minnesota, USA

<sup>b</sup> Strategic Improvement Systems, LLC Excelsior, MN, USA

<sup>c</sup> Lally School of Management and Technology, Rensselaer Polytechnic Institute, USA

Available online 22 June 2007

### Abstract

Six Sigma has been gaining momentum in industry; however, academics have conducted little research on this emerging phenomenon. Understanding Six Sigma first requires providing a conceptual definition and identifying an underlying theory. In this paper we use the grounded theory approach and the scant literature available to propose an initial definition and theory of Six Sigma. Our research argues that although the tools and techniques in Six Sigma are strikingly similar to prior approaches to quality management, it provides an organizational structure not previously seen. This emergent structure for quality management helps organizations more rigorously control process improvement activities, while at the same time creating a context that enables problem exploration between disparate organizational members. Although Six Sigma provides benefits over prior approaches to quality management, it also creates new challenges for researchers and practitioners.

© 2007 Published by Elsevier B.V.

**Keywords:** Quality management; Six Sigma; Organizational issues; Case/field study

*All truth passes through three stages. First, it is ridiculed. Second, it is violently opposed. Third, it is accepted as being self-evident.*

Arthur Schopenhauer

### 1. Introduction

Six Sigma has been characterized as the latest management fad to repackage old quality management

principles, practices, and tools/techniques (Clifford, 2001). At first glance Six Sigma looks strikingly similar to prior quality management approaches. However, leading organizations with a track record in quality have adopted Six Sigma and claimed that it has transformed their organization. For example, 3M's Dental Division won the Baldrige Award (Aldred, 1998) and then later adopted Six Sigma to improve performance even further (McClenahan, 2004). The financial performance of 3M since Six Sigma adoption has been very impressive (Fiedler, 2004). Other organizations with a quality track record, such as Ford, Honeywell, and American Express, have adopted Six Sigma as a way to further enhance business performance (Hahn et al., 2000). This creates a dilemma: on the one hand, skeptics argue that Six Sigma lacks discriminate validity over prior approaches to quality management; on the other hand, quality-mature organizations adopt Six Sigma to enhance performance.

<sup>☆</sup> This research was supported in part by National Science Foundation grant, NSF/SES-0080318.

\* Corresponding author at: Curtis L. Carlson School of Management, University of Minnesota, 3-150 CarlSMgmt Building, 321-19th Avenue South, Minneapolis, MN 55455, USA. Tel.: +1 612 624 9544.

E-mail addresses: [rschroeder@csom.umn.edu](mailto:rschroeder@csom.umn.edu) (R.G. Schroeder), [klinderman@csom.umn.edu](mailto:klinderman@csom.umn.edu) (K. Linderman), [caliedtke@aol.com](mailto:caliedtke@aol.com) (C. Liedtke), [chooa@rpi.edu](mailto:chooa@rpi.edu) (A.S. Choo).

<sup>1</sup> Tel.: +1 612 626 8632.

<sup>2</sup> Tel.: +1 952 380 0778.

<sup>3</sup> Tel.: +1 518 276 3338.

Scholarly inquiry into this management approach has been limited. While many books and papers on Six Sigma have emerged in the practitioner literature (Breyfogle, 1999; Harry and Schroeder, 2000; Pande et al., 2000), academic research on Six Sigma is just beginning to come forward. Scholarly research is needed to develop an in-depth, scientific understanding of Six Sigma and separate fact from fiction.

This paper finds that indeed the philosophy and tools/techniques of Six Sigma are strikingly similar to prior quality management approaches. However, the way Six Sigma is practiced represents a new organization structural approach to improvement. Six Sigma helps an organization become more ambidextrous by providing a *switching structure* (Daft, 2001) that allows the organization to act more *organically* in coming up with new improvement ideas and operate more *mechanistically* when implementing them. Furthermore, the structure of Six Sigma employs numerous mechanisms that simultaneously promote the conflicting demands of *exploration* and *control* in the improvement effort. As a result, what is new in Six Sigma when compared to prior quality management approaches is more its organizational implementation rather than the underlying philosophy or the quality tools/techniques employed.

At this early stage in the development of scientific knowledge about Six Sigma, academic research needs to address three questions:

1. What is the base definition of Six Sigma and possible variants?
2. What is the theoretical basis underlying Six Sigma?
3. What is new about Six Sigma relative to the existing literature?

Our research addresses these questions using a grounded theory approach. This approach helps develop an in-depth, relevant understanding of poorly understood phenomena (Eisenhardt, 1989; Meredith, 1998; Yin, 1994). Since no clear definition or theory has emerged to explain Six Sigma, conceptual development can take place by using field observation, the literature, and/or pure thought. This paper employs all three approaches to provide a solid basis for the emergent theory development and subsequent testing.

After discussing the literature in the next section, we define Six Sigma from our grounded theory research and propose an underlying theory for Six Sigma. We then address what is new and propose some future research directions. The result is a grounded theory that has potential value for advancing the scientific understanding of Six Sigma.

## 2. The literature

Motorola originally developed Six Sigma in 1987 and targeted an aggressive goal of 3.4 ppm defects (Barney, 2002b; Folaron, 2003). In 1994 Larry Bossidy, CEO of AlliedSignal, introduced Six Sigma as a business initiative to “produce high-level results, improve work processes, expand all employees’ skills and change the culture” (ASQ, 2002, p. 14). This was followed by the well-publicized implementation of Six Sigma at General Electric beginning in 1995 (Slater, 1999).

Currently, there are many books and articles on Six Sigma written by practitioners and consultants and only a few academic articles published in scholarly journals (Linderman et al., 2003, 2004). Reviewing the practitioner literature and these academic articles provides a starting point for defining Six Sigma.

Six Sigma has been defined in the practitioner literature in a variety of ways. This disparity leads to some uncertainty and confusion. Consider some of the following definitions from the practitioner articles. *Quality Progress* called Six Sigma a “high-performance, data-driven approach to analyzing the root causes of business problems and solving them” (Blakeslee, 1999, p. 78). Harry and Schroeder (2000), in their popular book on Six Sigma, described it as a “business process that allows companies to drastically improve their bottom line by designing and monitoring everyday business activities in ways that minimize waste and resources while increasing customer satisfaction” (p. vii). Hahn et al. (2000) described Six Sigma as a disciplined and statistically based approach for improving product and process quality. On the other hand, Sanders and Hild (2000) called it a management strategy that requires a culture change in the organization. Recognizing the divergence in definitions, Hahn et al. (1999) noted that Six Sigma has not been carefully defined in either the practitioner or academic literature.

Many of the definitions of Six Sigma found in the literature are very general and do not provide elements—or factors (variables, constructs, concepts), as Whetten (1989) described them—to define the “what” of the theory, nor do they describe relationships among the elements to define the “how.” Therefore, our data collection focused on obtaining a scientific definition of Six Sigma and then extracting both the elements of Six Sigma and their relationships.

## 3. Field data and analysis

In order to develop a rich understanding of Six Sigma we selected two corporations that had implemented it,

متن کامل مقاله

دریافت فوری ←

**ISI**Articles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات