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The implementation of Lean Six Sigma for operational excellence in digital emerging technology companies

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Abstract

Purpose: The purpose of this research is to develop a better understanding of the hurdles in implementing Lean Six Sigma (LSS) for operational excellence in digital emerging technology companies.

Design: We have conducted case studies of LSS implementations in six United States based companies in the digital emerging technology industry.

Findings: Critical success factors (CSF) for LSS implementations in digital emerging technology companies are: (1) organizational leadership that is engaged to the implementation, (2) LSS methodology that is rebranded to fit existing shared values in the organization, (3) restructuring of the traditional LSS training program to include a more incremental, prioritized, on-the-job training approach, and (4) a modified LSS project execution methodology that includes (a) condensing the phases and tools applied in LSS projects, and (b) adopting more iterative project management methods compared to the standard phased LSS project approach.

Implications: Implications comprise the awareness and knowledge of critical success factors and LSS methodology modifications specifically relevant for digital emerging technology companies or companies that share similarities in terms of focus on product development, innovation and growth, such as R&D departments in high-tech manufacturing companies.

Limitations: The qualitative nature of our analysis and the geographic coverage of our sample limits the generalizability of our findings.

Originality: Research on industry specific enablers for successful LSS implementation in the digital emerging technology industry is virtually absent. Our research informs practitioners on how to implement LSS in this and alike industries, and points to aspects of such implementations that are worthy of further attention from the academic community.

Keywords: Six Sigma, Lean Management, Digital Technology, Implementation

1. Introduction

In recent years, companies in digital technology industries have experienced rapid growth, due to among other reasons, the fast penetration of worldwide internet availability. Digital technology companies are traditionally defined as “*businesses that provide a digital technical service/ product/ platform/ hardware, or heavily rely on it, as its primary revenue source*” (Tech Nation, 2016). The digital technology industry however comprises several categories, such as the development of software (12%), devices and infrastructure (23%), IT and business services (21%), telecom services (26%) and finally emerging technologies (19%) (CompTIA, 2020). Companies categorized under “emerging technologies” are, or for long have been, involved in technologies that span multiple categories, as is the case for most emerging as-a-service solutions that include elements of hardware, software and services, which currently comprises amongst others Internet of Things applications, experimentation with the use drones and many other recent automation technologies.

The consequence of the rapid growth in this industry is an entrepreneurial focus on product development, human resource attraction and retainment and financing needs to support further growth. When companies transcend the initial start- and scale-up phases and become established, public scrutiny will increase. Stakeholders from capital markets, governments and society will impose demands on profitability and internal efficiency, regulatory compliance and legitimate corporate conduct. Hence, the control and optimization of processes becomes more important. Strategies used by companies to adequately respond to such demands comprise a focus on operational excellence and by the implementation of well-known operational excellence methodologies such as Lean management and/ or Six Sigma companies aim to eliminate operational inefficiencies and enhance operational control (Delgado et al. 2010).

In recent years the Lean and Six Sigma methodologies are applied and studied as one (Shah et al., 2008). Nevertheless, Lean Six Sigma (LSS) has a long history of development and was popularized in the production sector by companies such as Toyota, Motorola and General Electrics in the mid and late 20th century (Shah et al., 2008). Ever since, the methodology has been widely implemented in sectors such as finance, healthcare and public administration. Research on such implementations revealed that industry idiosyncrasies call for modifications of the methodology for effective implementation (Antony et al., 2020; Sreedharan and Raju, 2016).

The digital emerging technology (DE-TECH) industry is rapidly growing both in size and importance for everyday societal lives. Broader information technology industry trends reveal that the portion of economic activity resulting from this sector is outgrowing traditional sectors such as retail, construction and transportation (CompTIA, 2020). In recent years, an increasing appetite for LSS implementation in DE-TECH companies is observed (PEX, 2019; McKinsey, 2014). However, the research on LSS implementation in this industry is virtually absent. In this research, we aim to develop a better understanding of the hurdles in implementing Lean Six Sigma (LSS) for operational excellence in DE-TECH companies. We do so by (1) identifying the idiosyncrasies relevant for the implementation of LSS; (2) observing modifications of the LSS methodology in effective implementations and; (3) exploring the complementarities of data analytical capabilities that naturally exist in DE-TECH companies, with analytical techniques used in LSS implementations.

This paper presents the results from multiple case studies of companies in the DE-TECH industry that have commenced LSS implementation. Within- and cross case analysis is performed based on in-depth semi-structured interviews with LSS implementation leaders and practitioners. First, this study explores critical success factors. We find prevalent critical success factors that have previously been identified in the literature, such as leadership that is engaged to the implementation, LSS methodology that is rebranded to fit existing shared values in the organization and finally a restructuring of the LSS training approach whereby a more incremental, prioritized, on-the-job training approach is applied. Other findings are newly identified, such as often seen modifications of the structured LSS project method by consolidation of specific phases or tools in LSS projects and the application of more iterative project management methods. We find limited complementarities and amendments to LSS's existing statistical toolbox and finally, implications for practice and future research are presented.

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