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Integration of Ergonomics and Lean Six Sigma. A model proposal

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Abstract

Lean Six Sigma (LSS) aims to help companies continuous improvement (CI), coping with the strong business competition and gaining organizational effectiveness. Both Ergonomics and LSS are system-oriented approaches and could have a synergistic effect in CI. The integration of Ergonomics and LSS requires a new methodological framework that evolves from their single approaches, which coherently applies the principles of both and simultaneously ensuring gains in productivity and in working conditions. To help SME (99% of all businesses in EU) to realize their full potential a tool that supports the implementation of the mentioned framework is also desirable. A practical tool to fulfill this goal can assume the form of a Decision Support System (DSS). Therefore the objective of this paper is to present the model of a framework and of an associated DSS.

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1. Introduction

The continuous improvement that some companies are embracing today in order to achieve operational and service excellence are a consequence of the increase in competition, of internationalization and of an economic conjuncture that makes consumers more demanding regarding the cost of what they buy. Therefore, companies feel the need to adjust their management strategies and to continuously improve performance in all areas (e.g., operations, organization) keeping up with competitors or, if possible, overtaking them [1].

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Both Lean Management and Six Sigma philosophies have been referred to as the most promising initiatives in continuous improvement of organizations [2]. Lean focuses on eliminating the sources of waste, aiming a continuous process flow, while Six Sigma focuses on reducing the process variability. It is widely accepted that they are complementary approaches and companies tend to establish joint programs combining Lean and Six Sigma [3]. Therefore nowadays these two philosophies are being used as one approach, designated as Lean Six Sigma (LSS). The LSS concept represents a business philosophy and strategy to drive continuous improvement of production processes to reach higher customer satisfaction and profit [2]. They are very important approaches to reach good productive performance, since they focus on reducing waste, variability and costs of production [4].

What companies fail to realize is the potential for further improving the productivity gains if ergonomic principles were integrated and implemented simultaneously with LSS. The inclusion of Ergonomics in the continuous improvement process is quite important since traditional LSS interventions, while trying to maximize productivity by minimizing resources, can easily miss the limitations and needs of the human factor in the productive process.

Both Ergonomics and LSS are system-oriented approaches. However, frequently Ergonomics is not viewed by managers this way. Since Ergonomics is most often housed within the Occupational Safety and Health (OSH) department (mainly to answer legal requirements and to perform risk management), managers tend to inadvertently restrict its scope of intervention to hazards, instead of benefiting from its help to improve organizational effectiveness, business performance or costs. In fact, stovepiped approaches lead to less than optimal results. Therefore, continuous improvement processes should be performed applying simultaneously Ergonomic and LSS approaches in a coherent fashion to ensure both gains in productivity and in working conditions. For reaching this goal of integrating Ergonomics and LSS a methodological framework is required.

Contrary to multinational companies, which potentially have enough awareness, resources (money and personnel) and competences to develop continuous improvement processes tailored to their specific needs, Small and Medium-Sized Enterprises (SME) lack such capabilities. The concern with SME is relevant because of their number and because they are a key driver for economic growth, innovation, employment and social integration in European Union (EU) economy. In fact SME represent 99% of all businesses in the EU economy [5]

In order to help SME realize their full potential in today's global economy a tool that supports the implementation of the mentioned methodological framework of the continuous improvement process is also desirable. A practical tool to fulfill this goal can assume the form of a Decision Support System (DSS).

The objective of this paper is to present the model of a framework and of an associated Decision Support System conceived to help the decision making process of SME managers in the execution of an integrated implementation of Ergonomics and LSS continuous improvement processes.

This paper is organized as follows. After the Introduction, a problem domain overview section addresses core concepts regarding Lean Six Sigma, Ergonomics and Decision Support Systems. This is followed by the discussion of an Ergonomics and Lean Six Sigma integration framework and a brief presentation of a DSS model to support it. Finally some Conclusions will summarize the topics discussed in the paper.

2. Problem domain overview

2.1. Lean Six Sigma

Lean Six Sigma results from two different but complementary management philosophies: Lean Management and Six Sigma. Lean Management is a production philosophy that evolved from the Toyota Production System (TPS) and appeared after the 2nd World War [6]. Its objective is to help companies achieve on time the delivery of the right product quality and quantity to satisfy customer demand. It is based on the following five principles [7]:

- Specify Value – it is necessary to specify what adds value from the end customer's perspective, so that all the non value activities can be identified and removed; in fact for most production processes only a small part of the total production time and effort adds value for the end customer;
- Identify the Value stream – identify all activities that don't aggregate any value to the final product;
- Create Flow - promote continuous flow in the process by eliminating wastes;

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