Chapter 6
Impact of Macroergonomic Organizational Elements on the Performance of Manufacturing Systems

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ABSTRACT

This chapter analyzes the effects of macroergonomic compatibility of organizational elements on the performance of manufacturing systems in terms of Clients, Manufacturing Process, and Organizational Performance. As methods, a macroergonomic compatibility questionnaire is developed, statistically validated, and administered to middle and senior managers of manufacturing companies. Also, a hypothetical causal model is proposed and tested to find relationships among the constructs by using a Structural Equation Modeling. Direct, indirect, and total

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effects are determined, and results show that macroergonomic organizational elements have significant direct effects among themselves. Likewise, it is found that Organizational Culture and Organizational Communication have significant direct effects over Clients and significant indirect effects over Manufacturing Process and Organizational Performance. Finally, the Manufacturing Process has significant direct effects over Clients and Organizational Performance, while Clients have a significant direct effect over the Organizational Performance.

INTRODUCTION

In today's highly competitive markets, effectiveness of manufacturing systems should be partly guided by an analysis of the macroergonomic factors that include human resources, the company's organization, technology implemented, tasks performed, and the physical environment in which employees perform their tasks. The model called Systems Engineering Initiative for Patient Safety (SEIPS) (Carayon et al., 2006, 2014) offers this macroergonomic approach to analyze manufacturing systems. It is a human factors systems approach successfully applied to healthcare research and practice (Carayon et al., 2014). Moreover, although it was initially developed for health work systems, it can be adapted and applied to various manufacturing systems thanks to its flexibility (Carayon et al., 2014; Chui, Mott, & Maxwell, 2012). Therefore, SEIPS serves as a useful framework to study work changes and the design of these work systems. Likewise, it provides a holistic view of a work system, instead of focusing on a single factor.

In this chapter the SEIPS model provides the macroergonomic organization factor and its elements of *Organizational Culture*, *Organizational Communication*, and *Teamwork* for the design of work systems. It also includes the dependent variables of *Clients*, *Manufacturing Process*, and *Organizational Performance*, which can be impacted by the macroergonomic organizational elements.

On the one hand, Macroergonomics is the study of work systems, on the other, macroergonomic compatibility exists when a work system supports an appropriate interaction between the personnel and the technological subsystems, including the relationship of the work system with external environment characteristics (Lange-Morales, Röbig, & Bruder, 2011). This compatibility of interaction should be considered at all levels, including the physical, perceptual, cognitive, emotional, social, organizational and environmental levels (Karwowski, 2000). Therefore, several authors have addressed ergonomic compatibility either at a micro- or macro-level (Haro & Kleiner, 2008; Karwowski, 2000, 2001; Lange-Morales et al., 2011; Maldonado, García, Alvarado, & Balderrama, 2013). However, it seems that so far no work has yet developed a method to measure macroergonomic compatibility.