Chapter 86
The New Challenges in the Training of the Engineer for the Industry 4.0: A Case Study of a Brazilian University Center

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ABSTRACT

The growing changes brought about by new concepts and new technologies, such as Industry 4.0, have demanded that educational institutions seek new teaching and learning methodologies, as well as new resources that can contribute to the training of the future engineer. This chapter demonstrates some practices adopted in the process of training the future engineer in a university center in the interior of the state of São Paulo through the use of the CDIO initiative. The results presented confirm the importance and necessity of changes in the teaching and learning process in higher education institutions.

INTRODUCTION

Since the beginning of time, evolution has been a constant in all areas, there is always the need to adapt and innovate to follow the various changes that have been taking place in the world, both for companies, industries, services, as well as people. Industry 4.0 or the fourth industrial revolution, as many call it, reflects these changes and the various adaptations that are necessary for business development and continuity to be possible, where people need to innovate and adapt to new realities and technological and

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market trends, as new professions emerge while others disappear, new business segments thrive while others decline, and so on.

While executives are aware of the imperative need to embrace innovation as a business strategy, they recognize that they lack the knowledge of the tools and tools that make it possible to put theory into practice. "Companies do not adopt consistent practices of innovation, do not prepare their leaders, and do not have ways to measure the innovation process" (Scherer & Carlomagno, 2016, p. 4).

Still according to Scherer & Carlomagno (2016), few companies are considered innovative because innovating demands time, needs to value people, means tolerating mistakes, taking risks and changing, but above all must lead to results. However, in the world where total quality and zero defect prevail, there is not much room for creativity and innovation, as it is cheaper to continue doing the usual and routine than to devote time and resources in the search for new and uncertain alternatives, where the development of a new idea, a new product or a new process can take months or even years, because to innovate it is necessary to incorporate the new knowledge obtained for the elaboration of new products and services that add value to the company. The process of innovation is based on the sharing of tacit knowledge, which is in people's minds, and encouraging the sharing of this knowledge means valuing people.

Knowledge is one of the greatest human assets because it is the result of a complex combination of skills, competencies and attitudes that allow a person to understand, critique, analyze and interpret facts and data, developing the ability to master techniques, processes, ideas, concepts and evolutions (PÁDUA FILHO, 2016). For Alvarenga Neto (2008), knowledge companies are organizations that have information and knowledge that make them differentiated, with capacities of perception and discernment, capable of generating value for themselves. However, "successful organizations will increasingly move from hierarchical structures to more collaborative and networked models" (SCHWAB, 2016, p.65).

In this context the approaches in this work are made, with the objective of presenting the industry scenario 4.0, as well as the skills and competences for the production engineering professional that will act in this new world scenario.

THEORETICAL BACKGROUND

Effectively started in the second decade of the 21st century, more precisely between the years 2013 and 2016, the fourth industrial revolution is characterized by the convergence of important levels of sensing, control and artificial intelligence driven by globally established mass communication and intercommunication requirements (STEVAN JUNIOR; LEME & SANTOS, 2018).

However, according to Schwab (2016), the fourth industrial revolution is not just about connected systems and intelligent machines, because waves of new discoveries occur simultaneously in areas ranging from gene sequencing to nanotechnology, from renewable energies to quantum computing. "What makes the fourth industrial revolution fundamentally different from the previous ones is the merging of these technologies into the interaction between physical, digital, and biological domains" (SCHWAB, 2016, p.16).

Industrial Revolutions: Historical Evolution

To arrive at the fourth industrial revolution, radical and abrupt changes occurred throughout history. According to Assad Neto et al. (2017) and Schwab (2016), the first industrial revolution occurred between