

Systematic Proposal for Risk Hierarchy in Decision Support for The Implementation of Industry 4.0 Concepts in The Oil and Gas Industry Production Chain

Carlos Eduardo de Lemos Monteiro and Osvaldo Luiz Gonçalves Quelhas

Master's and Doctorate Program in Production Engineering

Engineering School

Universidade Federal Fluminense

Rio de Janeiro, Brazil

carlos_monteiro@id.uff.br

osvaldoquelhas@id.uff.br

Abstract

The adoption of industry 4.0 concepts by companies is causing profound changes in all sectors, marked by the emergence of new business models, remodeling of production, consumption, transportation and delivery systems [11]. Society also expects the transformation of industrial production to achieve achievements in the three dimensions of sustainability, namely economic, environmental and social [8]. On the other hand, the adoption of industry 4.0 concepts implies risks and challenges for society, such as job losses and changes in educational standards [9]. Although there is no consensus recommendation on the pace of industry 4.0 deployment, it seems peaceful that the production chain of the oil and gas industry is lagging behind in this process when compared to other industrial sectors [5]. Decision support systems have been the subject of active research by organizations for their development [6], while important measures have been widely used as decision support indicators, such as information and risk analysis [4]. Considering this demand, the present research seeks to evaluate how professionals of the oil and gas industry production chain rank the risks, based on the economic, social, environmental, technical and legal dimensions, when making the decision for the implementation of industry 4.0 concepts. From the risk model for industry 4.0 within the context of sustainability, developed by Birkel et al. [2], identified after bibliographic research and complemented by other authors [1,3,7,8,9,10,11,12], all consulted in the Scopus database, a Likert questionnaire was developed that allowed a qualitative assessment of the degree of relevance of each risk. In order to ensure the qualification and significance of the sample, the questionnaire was sent only to professionals from oil and parapetroleum companies with experience in technology and/or innovation. The use of the sampling strategy for convenience described resulted in 103 questionnaires answered, out of a universe of 536 requests for completion forwarded. The analysis methodology consisted of using descriptive statistics, comparing data between groups of respondents and conducting non-parametric statistical tests, since the data subject to analysis were categorical, that is, nominal and ordinal. In this way, research in determining how deployment risks are hierarchical will serve as a decision support resource in management. The originality of the research lies in the possibility, analyzing the academic impact, of a new perspective of understanding the risks in the decision-making process for the implementation of industry 4.0 concepts within the oil and gas industry production chain.

Keywords

Decision Support, Industry 4.0, Oil Industry, Production Chain.

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Biographies

Carlos Eduardo de Lemos Monteiro is a Regulatory Specialist at Agência Nacional do Petróleo and has over 13 years experience as university Professor at Universidade Estácio de Sá (Rio de Janeiro). He earned his degree in Chemical Engineering from Universidade Federal do Rio de Janeiro (1997) and his law degree from Universidade Estácio de Sá (2013). He is pursuing a Master's degree in production engineering.

Oswaldo Luiz Gonçalves Quelhas earned his degree in Construction Engineering (1978) and his Master's degree in Construction Engineering (1984) from Universidade Federal Fluminense (Rio de Janeiro). He obtained his doctorate focusing on decision making for supplier choices in the production chain from Universidade Federal do Rio de Janeiro, COPPE. He conducts research in association with teachers from Universidade de Hamburgo (Alemanha); University at Sherbrooke (Canadá); Faculty of Education at North-West University (South Africa); Universitat Politècnica de Catalunya (Barcelona, Spain); Manchester Metropolitana University (South Africa); Department of Environment and Planning , Faculty of Architecture - Damascus University (República Árabe, Síria); Department of Environmental Science, University of Latvia, (Raina, Latvia); Faculty of Philosophy, University of Belgrade, (Belgrade, Serbia). With 22 years of professional experience: oil and gas industry and engineering design and execution companies. Professor at Universidade Federal Fluminense, School of Engineering, UFF. Participates as professor and advisor of Master's and Doctorate Program in Production Engineering. Ad Hoc Consultant in R&D Projects, CAPES, CNPq and FAPERJ; Author and Evaluator in national and international journals. Editor of BJO&PM - Brazilian Journal of Operations and Production Management (ISSN:2237-8960) / ABEPRO (SINCE 2015), President of ABEPRO (Production Engineering Association) in 2006-2007 and 2008-2009 terms.