

Evaluation of Serious Game Usage in Industrial Training: A Case Study of an Automotive Manufacturer

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Abstract

The objective of this research is to evaluate the use of serious games as an active teaching methodology to enhance the training of employees in a vehicle manufacturing plant. The study assesses four cases applying analog game (Lego) and a digital game (Bicycle Factory), which challenge employees to solve problems and achieve game objectives related to Lean Manufacturing concepts. These games involve groups of employees from different organizational levels and knowledge about Lean Manufacturing. The Instructional Materials Motivation Survey (IMMS) was applied to assess students' perspective related to attention, relevance, confidence, and satisfaction during the game application. The results revealed high student satisfaction using games to learn Lean Manufacturing tools, as well as favorable scores in the initial knowledge retention assessment. The theoretical contributions involve a comprehensive discussion on the use of games in academic and corporate context. Practical implication guides how different dynamics, whether analog or digital, fared in student evaluations and whether there are differences in satisfaction. Results from the four cases demonstrate a high degree of favorability towards the games application and a satisfaction motivation parameter exceeding 98%.

Keywords

Active learning, Game-based learning, Simulation game, Serious games.

Biographies

Marcos Fonseca Oliveira is a master student in the Executive graduate program in Production Engineering at São Paulo State University (UNESP, Brazil). He holds an MBA from the University of São Paulo and a Bachelor of Science degree in Production and Mechanical Engineering from the Industrial Engineering Faculty (FEI, Brazil). With over 40 years of professional experience, he currently serves as the Vice President of Production at the Hyundai plant (Sao Paulo, Brazil). Prior to assuming the role of Vice President, he led the manufacturing and quality control departments. Before joining Hyundai, Marcos held the position of Manager of Continuous Improvement at Circor. Previously, he served as the Quality Manager at Fiat and Alfa Romeo in the Cassino Plant, Italy. Marcos also

has a background of 16 years with the VW Group. His research interests encompass a wide range of topics, including quality, simulation, optimization, reliability, serious games, manufacturing, and lean.

José de Souza Rodrigues Professor in the Department of Production Engineering at the Bauru Campus of the São Paulo State University Júlio de Mesquita Filho (UNESP) since January 1995. Graduated in Mechanical Engineering from the Faculty of Engineering at Guaratinguetá - UNESP, master's degree in production engineering from COPPE/UFRJ, and Ph.D. in Production Engineering from COPPE/UFRJ. Postdoctoral research at the Department of Production and Systems at the University of Minho, Azurém Campus, Portugal. Became an Assistant Professor in 1998 and an Associate Professor in 2010, teaching at the undergraduate level, specialization, and in the Professional master's Programs in Administration at the Faculty of Agricultural and Veterinary Sciences, São Paulo State University 'Júlio de Mesquita Filho', and in Production Engineering at the Faculty of Engineering in Guaratinguetá. Served as a referee for various national and international journals, and Creator of the GEPROS Journal - Production, Operations, and Systems Management, acting as its editor. Possesses expertise in the field of Production Engineering, with an emphasis on Planning, Design, and Control of Production Systems, primarily engaged in the following areas: development and use of business simulation games (business game), engineering education, simulation of organizational environments and processes. Created the models for the business games 'Virtual Market' and 'Good Burger', overseeing the teams that developed the software for the games (students from the Technical College of UNESP/Bauru with technical support. Served as an advisor for INEP/MEC from 2005 to 2013 for the ENADE. Vice-Director of the Faculty of Engineering in Bauru, FEB/UNESP.

Jorge Muniz Jr is Associate Professor at São Paulo State University (UNESP, Brazil), Visiting Professor at the University of Birmingham (UK, 2022-2023), Associate Editor of Production Journal (2018 - ...). He has a PhD in Engineering from UNESP (Production Engineering), with thesis awarded by the Brazilian Association of Production Engineering (ABEPRO) on Worker Knowledge Management, and a master's from the Polytechnic School (Production Engineering, USP), with dissertation distinction related to Concurrent Engineering at Embraer. Additionally, he was an executive at the Ford Motor company. He currently works in an international research group on Social Systems and Future Manufacturing (Industry 4.0), and Knowledge Management in Production Systems.