Innovative Mixed-Reality Simulations to Enhance Collaborative Team Skills in Global Engineering Teams: A Research Proposal

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Abstract

In the age of globalization and internationalization, the management of a global team with diverse backgrounds is one of the biggest challenges to an organization to gain competitive advantages in the global markets (SHRM, 2020). To ingratiate the need of the expectations of the international labor market and requirements of the organization in a global world, global business management education needs to provide students with skills and abilities to be able to successfully collaborate and work in diverse global teams in order to surmount language and cultural barriers which hinder team building and effective communication in global teams (Chen et al., 2021).

Advances in Mixed Reality (MR) enable interdisciplinary teams across the globe to work collaboratively on projects requiring technical and engineering skills. MR merges the real environment and virtual environment to provide a hybrid platform for interaction through manipulating virtual objects by using realistic gesture-based interaction. The visualization of 3D models on real or larger scales enables realistic and intuitive experiences while enabling individuals to remotely collaborate as teams. MR also enables remote meetings with virtual avatars displayed in the vision which benefits the global team collaboration with people around the world.

We propose a research study to measure the effectiveness of MR in helping learners' develop collaborative skills in global engineering teams. Specifically, we design an MR simulation in which teams composed of three members work remotely to complete engineering related tasks in real-time applying their technical knowledge, skills, and abilities while developing team skills such as knowledge sharing, debriefing, feedback exchange (Crans,

et al., 2021). Prior to participation in the simulation, a pre-test is given to each team member which includes items related to simulation content to measure their knowledge, their existing team experiences, their familiarity with MR and other immersive platforms, and their perceptions around remote team work. The simulation is composed of an introduction, a training, and a simulation. The introduction section serves as an orientation for the team to get familiar with the MR environment by practicing necessary MR hand gestures and interaction functions. Upon successful completion of this part, participants move to work together to assemble a technical machine model. Instructions to assemble the model are provided in the training section including video, animated 3D models, and text explanations of the machine parts. When the model assembly is completed, collaborative work is required to run the machine built as part of the simulation. The simulation section enables team members to engage in hands-on collaborative activities relted to the operation of the machine. As part of the data collection, participant interactions and conversations will be recorded while biometric sensors will be used for eye-tracking and heart rate. At the completion of the simulation, they will engage in qualitative self-report reflections about their experience in the simulation. Two weeks after the completion of the simulation, they will be given a posttest. The results of the proposed research will provide new insights as to the affordances of this new innovative technology in advancing business management education.

Keywords

Global Business Management Education, Interdisciplinary Global Engineering Teams, Mixed Reality, Collaborative Team Skills, Team

Biographies

Dr. Mesut Akdere is a Professor of Human Resource Development and the current interim associate dean for research at Purdue Polytechnic Institute. Dr. Akdere is the founding faculty and the faculty lead of the Human Resource Development undergraduate program at Purdue University. As the director of the *Purdue HRD Virtual Lab* and *Purdue HR Analytics Interactive Learning Lab*, Dr. Akdere's research focuses on simulated training virtual reality and in augmented reality learning environments for leadership development, workforce development in STEM fields, and human resource analytics in the age of big data. He has received over $18 million in funded external research grants from the National Science Foundation, the U.S. Department of State, the U.S. Department of Labor, the U.S. Department of Homeland Security, the US Department of Agriculture, and other federal and state agencies. He published in business, management, human resources, technology, training, organization development, and education journals. Dr. Akdere is the co-editor of the *Human Resource Development Quarterly* journal and also currently serving on the editorial boards of several international journals including *Human Resource Development Review*, *Human Resource Development International*, and *Advances in Developing Human Resources*.

Yeling Jiang is a 4th year Ph.D. candidate of Human Resource Development in the Department of Technology Leadership & Innovation at Purdue University-West Lafayette. Her research interests are simulation training in the virtual reality and mixed reality platforms, intercultural competence development, human resource analytics, and biometric analytics.

Minsoo Choi is a 2nd year Ph.D. student in the Department of Computer Graphics Technology at Purdue University-West Lafayette. He works in Purdue HRD Virtual Lab as a graduate research assistant and his research focuses on human-computer interaction in virtual, augmented, and mixed reality environments.