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Hassan Qudrat-Ullah

# Improving Human Performance in Dynamic Tasks

Applications in Management and Industry

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*To My Mother*

*Fazeelat Begum, who despite having limited resources and no formal education was able to provide the best possible education and training to us (five brothers and one sister) with hope-based attitude and inspirational stance on several conflicting and difficult situations. Mom, I still owe you a lot and still need your prayers.*

*-Hassan Qudrat-Ullah-*

# Preface

Improving human performance in complex, dynamic tasks has always been at the forefront of both research and practice of organizational decision making. Simulation-based education and training is a multibillion-dollar industry. The purpose of this book is to provide the reader with the knowledge about the design, development, validation, and application of an innovative, system dynamics-based interactive learning environment that includes a systematic debriefing. Specifically, a laboratory experiment is reported in which the participants managed a dynamic task by playing the roles of fishing fleet managers. A comprehensive model consisting of five evaluation criteria, (i) task performance, (ii) decision strategy, (iii) decision time, (iv) structural knowledge, and (v) heuristics knowledge, is developed and used. The key insights gleaned from the empirical data include the following: (i) the process-oriented debriefing improves subjects' performance better than the outcome-oriented debriefing, and (ii) contrary to the cost-benefit approach to decision making, more systematic effort is needed to perform better in dynamic tasks.

In the quest for innovative solutions for the education and training of people in dynamic tasks, many challenges lie ahead. Specifically, as we move towards displacing traditional thinking that people perform poorly in dynamic tasks, founded in dominant dynamic decision making literature, to one where plural logics of "systematic debriefing-based training with SDILEs" coexist under conditions of uncertainty and ambiguity, the need for systematic and integrated solutions for improving human performance in dynamic tasks becomes pronounced. Our aim here has been to focus our attention on the whole virtuous cycle of expertise development: decision making → learning → decision making. It is our hope that this book will stimulate a new way of thinking as a proclamation of a new era of resource constraints and a renewed focus on "integrative" solutions for people's education and training in dynamic tasks.

Dhahran, Saudi Arabia

Hassan Qudrat-Ullah

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Hassan Qudrat-Ullah  
Dammam, Saudi Arabia  
July 2019

# Content Overview

The integrating theme of this book is system dynamics-based perspective, cognitive apprentice approach, and learning principles to improve human performance in dynamic tasks. The book contains six chapters. Chapter 1, “Decision Making and Learning in Dynamic Tasks,” presents the concept of “dynamic task” and explains why learning and decision making in dynamic tasks are hard, what are the key challenges to decision making and learning in dynamic tasks, why system dynamics-based interactive learning environments (SDILEs) are an effective tool to improve people’s decision making in dynamic tasks, and why is the incorporation of debriefing into the design of an SDILE critical. Chapter 2, “SDILEs in Service of Dynamic Decision Making,” provides an overview and elaborates on the implementation of (i) HCI design principles, (ii) cognitive apprenticeship theory and *Gagné’s* nine instructional events, and (iii) structured debriefing and learning-inducing elements of any SDILE with the example of our developed and validated SDILE, SIADH-ILE. Also, a five-dimensional evaluative model is presented. Chapter 3, “The Experimental Approach,” explains the experimental approach through various dimensions. First, the research design is elaborated. Second, the dynamic task, SIADH-ILE, its casual structure, mathematics model, and interface design are explained. Third, the protocol of the experiment is also described. Chapter 4, “Results of Experimental Research,” presents our key results. Both the main effects and indirect effects of debriefing on these five dimensions are reported. Beginning with the descriptive analysis of our participant, we report the subjects’ performance and learning in the dynamic task. Subjects’ reaction to received debriefing as well as the effects of the practice is also reported here. Chapter 5, “Discussion and Conclusions,” presents key limitations of this study, our major findings, and implications of dynamic decision making research and of improving practice in dynamic tasks in various domains including computer simulation-based education and training, aviation, healthcare, and policymaking. We will also talk about how the users perceived the utility of SIADH-ILE in improving their decision making and learning in the dynamic task.

Finally, Chap. 6, “Future Research Directions in Dynamic Decision Making,” highlights the areas of research for future researchers.

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