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AUGMENTED INTELLIGENCE

THE BUSINESS POWER OF HUMAN–MACHINE COLLABORATION

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Foreword

Artificial intelligence (AI) has been around for decades. AI has long piqued our imagination about what is possible with this powerful technology—for good and for evil. There are a vast number of instances in which AI has played a role in both our culture and in our desire to create more sophisticated systems. In fact, AI has captured the imagination of data scientists and fiction writers for decades. Alan Turing introduced seminal work on the meaning of artificial intelligence in the 1940s with his famous Turing test. In the 1960s project, ELIZA gave us a glimpse into the future of artificial intelligence–based communications. ELIZA, a project designed at MIT's artificial intelligence lab, was one of the first natural language processing computer programs that created a way for humans to communicate with machines. Early science fiction novels were obsessed with artificial intelligence. For example, science fiction novels such as *Metropolis*, written by 1925 by German writer Thea von Harbou, imagined the world in the year 2026, where humans and robots would live together but engage in massive conflicts.

In the last few years, AI has re-emerged due to two main factors: the unprecedented compute ability to crunch huge amounts of data with improved machine learning algorithms, and the brilliant marketing buzz of AI and ML.

However, artificial intelligence is way more than a passing fad. It is already a major part of our daily lives and will continue to accelerate. It is clear that there is an enormous amount of accessible data. We now have the ability to synthesize this massive amount of data in order to better understand everything from changing customer behaviors to the ability to anticipate what customers will want to buy in the future. With the movement toward AI, we can improve our ability to more accurately predict future business trends and requirements. AI's impact on modern medicine, for example, cannot be overlooked. AI will help to analyze complex data to support the physician's ability to customize effective

treatments for patients. Across industries we are seeing important uses of AI that will be transformative.

Although AI has many types and forms, the most impactful in the immediate future is augmented intelligence. Augmented intelligence has profound ramifications because it empowers humans to truly leverage data to make better-informed decisions. The goal of augmented intelligence is not to replace people or automate them out of existence but to enable them to make better decisions based on complex data. In fact, the collaboration between humans and machines is the key enabler to our ability across industries to transition to the next stage of the information revolution.

One of the greatest impacts of augmented intelligence is the need to determine the accuracy of data in context. Understanding the context of data and the ability to actually trust this information is one of the most critical issues plaguing businesses today. If data can't be trusted or is inaccurate, decisions that are made based on that data could prove to be catastrophic. In addition to assuring data accuracy, data must be managed from a security, privacy, compliance, and risk perspective.

The book you are about to read is of great importance because we increasingly rely on machine learning and AI. Therefore, it is critical that we understand the ability to create an environment in which businesses can have the tools to understand data from a holistic perspective. What is imperative is to be able to make better decisions based on an understanding of the behavior and thinking of our customers so that we can take the best next action. This book provides a clear understanding of the impact of augmented intelligence on both society and business.

— Tsvi Gal, Managing Director
Enterprise Technology and Services
Morgan Stanley

Preface

Why This Book? Why Now?

Writing this book was a collaborative process among four seasoned professionals who have a common belief that when paired with human intuition and knowledge, artificial intelligence (AI) can change the world. The most pragmatic and useful way to benefit from AI and machine learning is to implement these powerful technologies as an augmentation to human intelligence. This hybrid approach—a partnership between humans and machines—is what is called *augmented intelligence*.

All four authors have a deep appreciation of the nuances of how we can harness the power of AI as a tool for transforming business. The value of our collaboration is that each of us brought a different perspective to a common goal of providing guidance and direction. Judith Hurwitz served as the author team leader. Judith has been a trusted advisor to many companies in a broad range of emerging technologies, ranging from data and analytics to cloud computing and business process. She has served on a variety of boards of advisors. In addition, Judith has coauthored 10 books, hundreds of e-books and articles, and is a frequent speaker and guest lecturer. Henry Morris is a technology thought leader with a PhD in philosophy from the University of Pennsylvania. Henry founded the analytics practice at the global research firm International Data Corporation (IDC), where he coined the industry term "analytic applications." Henry has decades of expertise in analytics applications, business process management software, and the complete data life cycle. Henry has consulted with a variety of organizations and businesses across the globe. Candy Sidner is a renowned AI research scientist with a PhD in artificial intelligence from MIT. She has written more than 100 research papers and is a fellow of the Association for the Advancement of Artificial Intelligence. Candy's involvement in the AI

community stretches from some of the earliest days of AI to today's emerging research areas. Daniel Kirsch is an attorney, senior consultant, thought leader, and author. Dan has written dozens of e-books and white papers on topics focused on the cloud, data, security, and compliance. Dan's research focuses on emerging technologies and their impact on businesses as well as the security, governance, and compliance implications of new technology.

The best part of writing this book was our weekly team meetings, where we discussed and debated the meaning of the movement to augmented intelligence and the need to create a hybrid approach that pairs humans with machines. Therefore, we bring a unique perspective to both the business and technical nuances required to use artificial intelligence on a collaborative platform that makes human responses to complex problems more achievable.

There is no doubt that artificial intelligence is powerful and provides huge benefits in being able to determine patterns that impact business outcomes. At the same time, the context and nuances of any field are vast. To make well-informed decisions, you must be able to assess data while utilizing human intuition and an overall understanding of the field in question. The human brain can make certain judgments and decisions incredibly quickly and accurately, but these choices are nearly impossible to codify into an artificial intelligence system. For example, you can't rely on a programmatic bot to suggest the right mix of painkillers to a patient without having a full understanding of that patient's physical and emotional state. You also need to understand the community the patient lives in and what support services are available. A person may appear on paper to be stable but might have some underlying issues in their home life that will impact treatment options. There is no machine learning model that can capture the full context of a person and their environment without human assistance.

As a team, we felt it was our obligation to put the extraordinary hype about artificial intelligence and machine learning in perspective. Venture capitalists have poured billions of dollars into companies that are promising to transform entire markets with intelligent systems that will understand everything and automate almost any task one can imagine. In addition, there is a wide variety of companies focused on AI, ranging from newly formed ventures to some of the most well-established public companies that are planning for their future. There are futurists who will tell you that artificial intelligence–based systems will be able to think at the same level as humans. We believe this claim is a misconception. There is no one technology that will have the power and intuition of human experts. The ability to translate complex data into applied knowledge may hold the key to solving some of the most complex problems we as humans face. It is our view that it is not enough to have a machine learning model and