

# Using big data to solve real problems through academic and industry partnerships

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Big data has revolutionized a number of industries as it provides a powerful tool for asking and answering questions in novel ways. Academic researchers can join this trend and use immense and complex datasets to explore previously intractable questions. Yet, accessing and analyzing big data can be difficult. The goal of this chapter is to outline various benefits and challenges of using big data for academic purposes, and to provide thoughts on how to succeed. The primary suggestion is for academics to collaborate with appropriate industry partners to simultaneously achieve both theoretical and practical advances.

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To understand the future impact of big data projects that are driven by academic–industry partnerships, experts from a variety of communities were asked to answer the following question:

*“Looking forward to the next 5 to 10 years, how do you think big data might be able to help you do your job better?”*

Their answers are provided throughout this chapter and gathered together in [Box 1](#).

## Introduction

The term ‘big data’ has become ubiquitous, and it generally refers to very large and complex datasets that can be analyzed to reveal hidden patterns and insights. From an

academic perspective, big data holds promise for completely revolutionizing entire fields by unlocking new avenues of research with more power than ever before. While it is clear that academics can use big data to solve real problems, there are many hurdles that can thwart well-intended plans. For example, one must capture the data in a useable format, have the necessary skill and resources to process the data, and have the appropriate industry and/or government connections to make the analyses practically useful. Such hurdles can be significant hindrances, yet overcoming them can have dramatic and meaningful results.

The current goal is to discuss how big data can be used to advance both science and applied practices (see [Figure 1](#)). We start with our own case study of *Gamifying Airport Security* to highlight the promises and struggles of our approach to leverage big data from a game to further science and improve real world airport security.

“The future of scientific analysis will be dramatically changed by big data. The traditional approach is to ask a question and then collect data to answer it. Big data does the reverse. You gather data without a purpose, play with the data and get a sense of what it can tell you. The traditional bases of soccer competition are eroding fast; Organisations have more and more data on hand but they have far less room for errors in execution, so decision-making has to be sharper and better informed. All in all, these factors call for superior analytics and deeper insights into what makes an organisation work. Analytics will involve the extensive use of data, statistical and quantitative analysis, explanatory and predictive models, and fact-based management to drive decisions and actions.”

**Tony Strudwick**

Director of Performance, Manchester United

## Gamifying Airport Security: using mobile data to advance science and aviation security

The two authors of this chapter are a seemingly unlikely pair — a cognitive psychology professor (Mitroff) and a mobile app developer (Sharpe) — however it is exactly this unlikely combination of skillsets that has allowed the formation of a successful partnership. Dr. Mitroff studies aspects of visual search — how individuals find targets amongst distractors. Mr. Sharpe has developed a number of mobile apps, one of which is *Airport Scanner* (Kedlin Company, [www.airportscannergame.com](http://www.airportscannergame.com)) — a game wherein the player serves as an airport security officer

**Box 1 The future impact of big data across industries.**

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“Continuing on this path of collaboration with “unlikely” partners provides us a new way of solving problems — as we move forward and have enormous amounts of data available to us, we need people who understand how to use these data to solve emerging problems. Dr. Mitroff and Sharpe have the uncanny ability to insightfully explore vast amounts of data to offer astute, remarkable recommendations and solutions.”

**Bonnie Kudrick**

**Program Manager, US Transportation Security Administration**

“As performance specialists, therapists, applied sport scientists, nutritionists, etc., we must listen to the voice of the athletes we train (and those that we don’t, but that we can learn from listening to). Said best by Matt Nurse at Nike NSRL, one key voice to listen to is their biometric data. This is a voice that tells a story at a depth specificity that no verbalization or visualization can provide. By itself, data are useless. But added to the other voices of the athlete (subjective and objective) we have the best ability to provide impactful solutions and management guidance to reach full athletic potential. Sometimes these data speak instantly, and other times retrospectively. Either way, without it we are truly flying the high performance plane blind.”

**Lance Walker, MS, PT**

**Director, Michael Johnson Performance**

“Advanced Analytics and Big Data are the motors of digital innovation, disruption and modern business transformations. Successfully competing in business is quickly becoming an entirely different ballgame: Winning requires mastery of data, of creating original insights, and of navigating transformative change when applying such insights to large organizations. My clients are using Big Data to improve their decision making, their processes, products and services. They develop new offerings, and the best find ways to out-innovate their competition and disrupt their respective industries. As a Bain Partner and facilitator of business transformations these are truly exciting and energizing times. We are leaders in advanced analytics and are investing heavily into Bain’s talent, our tools and techniques as we harness the power of Big Data to help our clients create such high levels of economic value that together we set new standards of excellence in our respective industries.”

**Rasmus Wegener, Ph.D.**

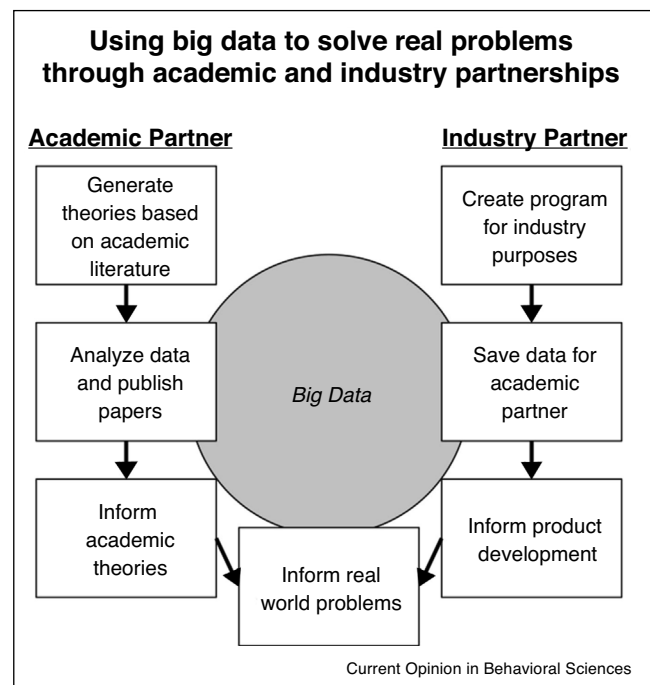
**Partner, Bain & Company**

“Big data is already reshaping the field of cancer control. The great promise over the next 5–10 years is the ability to get intensive longitudinal data on individuals. Anyone with a smartphone will be able to easily volunteer to contribute data on their cognitive function, activity levels, sleep habits, and a wide range of other behavioral variables. This will allow us to break the logjam on many outstanding problems in cancer prevention and control.”

**Todd Horowitz, Ph.D.**

**Program Director, National Cancer Institute, National Institutes of Health**

**Figure 1**



Academic–industry partnership. Centered on big data, academic and industry partners can pursue parallel path to advance academic theory, industry goals, and solve real-world problems.

looking for prohibited items in passenger bags (i.e. looking for targets amongst distractors).

In 2012, Dr. Mitroff had been studying the nature of visual search from a number of perspectives, and was actively working with the US Department of Homeland Security to explore how professional airport security officers search for threats. At this time, *Airport Scanner* became a highly success game, reaching #1 in the Apple App Store, resulting in millions of downloads worldwide. Dr. Mitroff came across the game and realized its potential for research purposes and emailed Mr. Sharpe hopeful for a collaboration. The two connected by video chat (they were on opposite sides of the US) and by the end of their first discussion, Mr. Sharpe saw the potential in forming a partnership and jumped at the opportunity. Specifically, Mr. Sharpe was enticed by three opportunities: firstly, that a game meant for entertainment could have an altruistic purpose to improve airport security, secondly, an opportunity to boost downloads from marketing and public relations from the app being used for research, and thirdly, the potential for future opportunities to expand the partnership and potentially further commercialize the product.

Several steps were taken to establish a formal partnership; a data sharing agreement was established between the university and company, the app was modified to collect and store the data, a web-based interface was created for

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