Preface

This book is about how organizations can use scientific methods to measure and control various risks resulting from strategic decisions. The increased flux in the business world due to new advances in the application of information technology, the increase in global competition spurred by technological advances, an increasing awareness of price and quality by consumers, as well as recent turmoil resulting from the last financial crisis has increased the necessity to search for new approaches to analyze the potential risks of making critical strategic decisions in the fiercely competitive global environment. On the other hand, the information age has created more opportunities to develop knowledge systems that can be used to assess these risks.

Although every organization must take some risks in our increasingly dynamic and changing world if they want to stay competitive, the level of risk-taking in the business world may have decreased in recent years. Various long-run trends seem to be pointing in this direction: companies are adding fewer jobs more slowly than in the past, investors are putting less money into new ventures, entrepreneurs are starting fewer businesses, and workers are less inclined to change jobs or move for new opportunities. The effects of the last recession have intensified this problem. Although these trends may not be permanent, they reveal how critical the assessment of risk can be in shaping the future growth of our economy. Financial theory generally assumes that business firms are risk averse (i.e., a lower level of risk is always preferable for the same expected return), but this assumption also implies that a higher level of risk can be acceptable for a greater expected return.

Keeping up with the today’s economic fluctuations and volatilities requires ongoing innovation, which demands a certain amount of risk. Sometimes many companies and industries choose the leadership mode that causes them to keep the status quo. The fear is that one new product mistake or market miscalculation can put a company so far behind that it never catches up or can even put the company out of business. Risk taking is not encouraged in many company cultures. One way to get the incentive back is to explore the opportunities afforded by information technology and scientific models that are used to manage and mitigate risks, not to avoid them. Companies need to make decision based on data, not air bubbles. One should never take a risk unless one has the data to support the decision. In today’s business environment, a leader may also have to grapple with too much data, rather than not enough, so it is also a challenge to assess what the significant sources of information should be.

Risk and uncertainty have always been a component of human decision making since its beginnings, but they have not always been perceived as such. The responses to risk when negative events occurred were prayer and sacrifice (often of innocents), since these events were attributed to divine providence or the supernatural. No measure of risk was therefore considered necessary because everything that happened was predestined and driven by forces outside our control. Even Greeks, with their consider-
able skills at geometry and numbers, never seriously attempted to measure the likelihood of uncertain events such as storms or droughts, relying instead on priests and fortunetellers. Even today, the belief that powerful forces beyond our reach shape our destinies is never far below the surface.

Given this historical focus on fate and divine providence, it is ironic that it was an Italian monk, Lucia Pacioli, who initiated the discussion of risk measures by posing a puzzle in 1494 that befuddled people for almost two centuries. The solution to his puzzle and subsequent developments were perhaps the first application of modern risk measurement and provided the groundwork for famous mathematicians such as Fermat, Pascal, Bernouilli, de Moivre, and Gauss, who laid the foundations for what we know today as probability theory which provides the mathematical tools to measure risk.

Since the days of Fermat and Pascal, the mathematical theory of probability and statistics has made enormous contributions to the sciences. In fact, quantum probability theory was a whole new foundation of probability theory that was developed in the 1980s as a way to clarify the mathematical foundations of quantum theory and its statistical interpretation. For example, a significant recent application to physics is the dynamical solution of the quantum measurement problem, giving constructive models of quantum observation processes that resolve many famous paradoxes of quantum mechanics.

There was never much connection between the methodologies and discoveries of science and the management of businesses until the early days of scientific management in the 1880s and 1890s when there were attempts to apply science to engineering of process and the management of industrial firms, but it was not until after World War II when more sophisticated mathematical techniques and theories were used to improve decision making in the business environment. As a formal discipline, operations research originated in the efforts of military planners during World War II. In the decades after the war, the techniques were evolved and applied more widely to problems in business, industry, and society. Operations research has now expanded into a field commonly used in business, industry, and government, moving to a focus on the development of mathematical models that can be used to analyze and optimize complex systems, and has become an area of active academic and industrial research. Using techniques from other mathematical sciences, such as mathematical modeling, statistical analysis, and mathematical optimization, operations research arrives at optimal or near-optimal solutions to complex decision-making problems. Because of its practical applications, operations research has overlap with other disciplines, such as industrial engineering and operations management, and draws on psychology and organization science and often draws on models from other sciences such as physics (theory of diffusion) and biological sciences (genetic algorithms, epidemiology models, etc.).

Operations research has made an extensive use of the classical methods of probability theory and statistics to deal with complex processes that involve uncertainty. More recently, operations research has incorporated the use of less traditional approaches to model uncertainty such as the use of fuzzy sets, which were introduced by Zadeh and Klaua as an extension of the classical notion of a set. Fuzzy relations are now used in many different areas such as linguistics, clustering, bioinformatics, and decision making.

Traditionally, studies and applications of operations research to strategic planning fall under the soft operations research heading, which utilizes methodologies that have been borrowed or adapted from other disciplines such as the systems sciences and many of the social sciences, predominantly sociology, psychology, and political science. In strategic planning the problem is generally not well-defined and many important factors cannot be quantified, and therefore, the application of mathematical models can be subject to a great amount of measurement error. It is also difficult to reduce uncertainties to probabilities in many strategic planning applications. On the other hand, strategic decision making is usually transparent in that the specialist usually plays the role of a facilitator with a group of participants.
Among the various soft operations research methodologies that have been used in strategic planning are the Soft System Methodology (SSM), the Viable Systems Model (VSM), Total System Intervention (TSI), Decision Trees and Influence Diagrams, Cognitive Mapping, which includes applications, such as Journey Making, and Strategic Options Decisions and Analysis (SODA), Strategic Choice Appraisal (SCA), Strategic Assessment Surface and Testing (SAST), Scenario Planning, Interactive Planning, Robustness Analysis (SSM), Meta- and Hypergames, the Repertory Goal Technique (RST), Delphi Methods, Political, Economic, Sociocultural, Technological (PEST) analysis, Sociological, Technological, Economic, Political (STEP) analysis, Strengths, Weaknesses, Opportunities and Threats (SWOT) analyses, and Multimethodology, which is the practice of combining several methods together in the same study.

Many see the application of hard operations research techniques as mathematical tools relevant only to detailed low-level technical problems. The approach can offer much more when one considers the possibility of using these techniques at the strategic level. Strategy development requires looking forward in a business. Since there are no facts about the future, the future is best described in statistical terms, such as: (1) sales may be below X or above Y but are most likely to be in the neighborhood of Z; (2) competitors may react to our price reduction by either keeping their prices flat or by lowering them to A, or in the extreme to B.

These variables can be translated into probability distributions of uncertain sales or competitor prices, and it is clear that these uncertain variables will have a major influence over whether a particular strategy is successful or not. Organizations usually build the models with the assumption that they know the models, components, structures, and parameters with certainty. This assumption can lead to less-than-optimal or even quite wrong decisions. Understanding the uncertainty in the factors that contribute to the strategy’s success or failure is crucial to making good decisions. Senior management can and should create an environment that is conducive to thinking about the future in terms of probability theory and statistics. Simulation can be a powerful statistical technique to better understand the effect of strategic decisions in an uncertain environment.

The rapid advances in information technology has changed the landscape of decision making opportunities for modern organizations by spurring the development of theories, methodologies, process, architectures, and technologies that transform raw data into meaningful and useful information for business purposes. For example, Business Intelligence (BI) refers to a set of methodologies that can handle a large amount of information to help identify and develop new opportunities. Implementing an effective strategy based on these opportunities can provide a competitive advantage and provide long-term stability. Common functions of business intelligence technologies are online process mining, text mining, analytical processing, analytics, reporting, data mining, complex event processing, business performance management, benchmarking, predictive analytics, and prescriptive analytics. These methods have opened new avenues for implementing new strategies for the firm. In its broadest sense, business intelligence methodologies are useful for all levels of decision making of the firm: tactical, operational, as well as strategic.

Of course these approaches (often called knowledge management systems) are nothing new. Although business owners have historically passed on their wisdom to their children, and craftsmen have taught their trades to apprentices, it wasn’t until the 1990s that top managers in organizations started talking about knowledge management. As the foundations of companies shifted from natural resources to intellectual assets, executives have been compelled to better understand the knowledge underlying their businesses and how that knowledge is used. The rise of networked computers facilitated this process by making it possible to codify, store, process, and share more easily and at a lower cost. The use of knowledge
management in the area of strategic planning can use both the codification and personalization approach to knowledge management. The codification approach is based upon knowledge being carefully codified and stored in databases where it can be easily accessed and used by anyone in the company. The personalization approach assumes that knowledge is closely tied to the people who developed it and is shared mainly through direct person-to-person contacts. The primary purpose of computers in this case is to help people communicate knowledge that has been facilitated by technological advances such as cloud computing, which has enabled users to obtain and store data more efficiently and at a lower cost.

The rapid advances in information technology have opened new possibilities to use hard, quantitative operations research and statistical techniques in the application of strategic decision making. For example, data mining (the analysis step of the “Knowledge Discovery in Databases” process), an interdisciplinary subfield of computer science, is the computational process of discovering patterns in large data sets involving methods at the intersection of artificial intelligence, machine learning, statistics, and database systems. The overall goal in data mining is to extract information from a data set and transform it into an understandable structure for further use. It can be a very effective tool in many strategic decision making problems in marketing, investment, and human resources. Data mining can play an important role for the firm to meet strategic goals by helping them to translate these goals into operational decisions.

It is useful to consider how the recent advances in information and decision sciences fit within the main templates of the field of strategic management. The dominant paradigm in the field during the 1980s was the competitive forces approach developed by Porter, which emphasizes the actions a firm can take to create defensible positions against competitive forces. Business intelligence and knowledge management systems are becoming critical tools to improve decision-making skills within this paradigm. A second approach is the strategic conflict approach, which is related to the first in its focus on product market imperfections, entry deterrence, and strategic interaction. The strategic conflict approach uses the tools of game theory and thus implicitly views competitive outcomes as a function of the effectiveness with which firms keep their rivals off balance through strategic investments, pricing strategies, signaling, and the control of information. Game theory has traditionally been part of the hard or quantitative focus of operations research, which shows how sophisticated strategic decision analysis can become an application of advanced operations research theory. Another distinct class of approaches emphasizes building competitive advantage through capturing entrepreneurial initiatives and activities stemming from fundamental firm-level efficiency advantages. Evidence suggests that firms build enduring advantages only through efficiency and effectiveness. Thus, the appropriate adoption and management of various technologies can play a critical role in the strategic management process.

Recent advances in information technology have also provided new opportunities for the application of risk management, which is the identification, evaluation, and prioritization of risks followed by a coordinated application of resources to minimize, monitor, and control them. Risks can come from uncertainty in financial markets, threats from project failures (at any phase in design, development, production, or sustainment life-cycles), legal liabilities, credit risk, accidents, natural causes and disasters, as well as a deliberate attack from an adversary, or events of uncertain or unpredictable root-cause. The mitigation of risks is an important element in any strategic planning process.

The effective management of data and information is the key to the success of any risk management effort regardless of an organization’s size or industry sector. Risk management information systems/services are used to support expert advice and cost-effective information management solutions around key processes. Risk management also plays a critical role in protecting an organization’s information assets and, therefore, its mission from information technology-related risk. An effective risk management process
is an important component of a successful information technology security program. The techniques of risk management can also be applied to problems related to the compatibility of information systems, technology acceptance, the successful integration of technological systems, quality management issues related to the adoption of various technologies and business processes, as well as the control of risks in project management. Since the principal goal of an organization’s risk management process should be to protect the organization and its ability to perform their mission, the risk management process should not be treated primarily as a technical function but as an essential management function of the organization.

Global considerations always will play a major role in many if not most strategic decisions. Sometimes researchers and practitioners of international market entry typically have a difficult task obtaining and processing requisite information to evaluate potential opportunities and risks. Essential analysis is often confounded by inappropriate measures of input requirements, inadequately defined information categories, and the overall complex nature of the decision process. Therefore, risk management technique as well as sophisticated analysis (such as the fuzzy logic as well as a variety of analytic techniques) can be particularly valuable when making strategic decisions in the global arena.

Although the potential for the application of quantitative methodologies and technological considerations to strategic decision making has increased dramatically in recent years, it is still very important to consider many of the traditional soft issues. For example, too often a company’s strategy that is imposed from above is at odds with the ingrained practices and attitudes of its culture. Executives may underestimate how much a company’s strategy depends upon cultural alignment. Of course, there are ways to address these kinds of issues, such to honor the strengths of the existing culture, and to measure and monitor cultural evolution within the firm.

Values and corporate responsibility should be an important consideration in business decision making. One of the areas of corporate responsibility is business sustainability. Business sustainability is managing financial, social, and environmental risks, obligations, and opportunities. These three impacts are sometimes referred to as profits, people, and planet. Clearly, there are many cases of strategic decisions that could have a long-term impact on either the immediate environment or the larger environment of the planet. These issues can complicate the decision-making process not only from a technical standpoint but also in terms of how the values of the people in the firm have an impact on the strategic decisions that are eventually put into place. Sustainability issues can be also viewed within the context of risk management – considering both the long-term risk to the firm as well as the long-term risks to the environment.

This book is divided into 11 chapters. In Chapter 1, titled “Incorporating Culture and Competition for Status into Quantitative Financial Epidemiology Models,” Hackney, Friesen, and McPherson develop a model that would more fully incorporate financial, psychological, and social dynamics considerations into individual household financial decision-making processes. They establish a link and show how those individual-level decisions can be aggregated to dynamic changes in the population of households “at risk” of financial insolvency. In doing so, they were able to explain why the public policies currently in place to help households (including bankruptcy and financial education) are insufficient to prevent households currently moving down a path towards insolvency from ultimately becoming insolvent. They also recognize that not all individuals are the same. The same factor (perhaps the utility weight given towards the acquisition of debt) may drive decisions to greater or lesser degrees across different types of peoples. In such cases, policies should reflect this heterogeneity. Perhaps more importantly, when major factors which drive consumer decisions are identified, it is important for financial educators working in the community to develop appropriate screening tools to identify which group a given individual belongs to, and to tailor interventions to ensure that the individual moves from an unsustainable borrowing path...
to something that is more sustainable. They show that those screening tools require a focus on financial characteristics, but also cognitive and sociological characteristics that individuals use when making financial decisions. They also argue that financial insolvency must be recognized as a community problem. A major implication of their chapter is that people who are financially healthy and on a sustainable borrowing path may, through their actions, be sending an adverse signal which induces others in the community to maintain an unsustainable borrowing path. Finally, they argue that the conceptualization of financial insolvency as a community problem also requires that policy makers track changing financial epidemiologic conditions and use that information to create and time interventions appropriately. They conclude that it is important that future empirical work attempt to estimate population rates of the risk for financial insolvency to gain a greater appreciation of the pervasiveness of the issue and to identify opportunities to reduce the pervasiveness, if necessary.

In Chapter 2, titled “How Can Success of IT Implementations Be Measured? The Case of Business Intelligence Systems,” Harison shows that the use of business intelligence systems has become commonplace amongst most firms in the economic and industrial sectors due to their immediate results and tangible advantages. He argues that business intelligence systems allow users to process and analyze preexisting data in different ways, thereby gaining new insight into the firm’s present activities. Business intelligence empowers decision-making processes within organizations, with a focus on the establishment and examination of new operations and strategies, which only magnifies the importance of properly conducted data analysis and interpretation in regards to the system’s use and outputs. His study has roots in two areas of research. First, he draws upon the similarities of various other information system implementations to locate critical success factors that can be used in evaluating a business intelligence system’s success. Next, he investigates other features unique to such systems, which reflect in some way their individual attributes. He shows that the installation of a business intelligence system can either succeed or fail based largely upon how much the information technology team participates by way of promoting the new system, helping to integrate it and serving as a collective of knowledge and support for users. The chapter concludes that information technology employees should therefore be required to involve themselves in business intelligence system implementation on a much wider range so as to fully understand the needs of users and how to enhance the economic and operational value organizations can derive from these systems.

In Chapter 3, titled “Selection of Market Entry Strategies: Perspectives from the Mobile Technology Industry in Africa,” Chanakira investigates the selection of market entry strategies in the African mobile telephony industry – a sector attracting significant foreign direct investment. He uses a survey methodology and focuses on six key enterprises, which account for over 60% of mobile phones in Africa. The empirical evidence suggests that market size in terms of population of the destination country and not psychic distance is the most important market selection criteria for enterprises entering Africa. He shows that the dominant entry market strategy for these enterprises is strategic alliances. More interestingly, and contrary to extant literature, he shows that political risk is not considered a market entry barrier. He concludes that these findings are important in informing investors engaged in or with intentions to enter Africa and in enriching international literature. The key contributions of Chanakira’s study are both theoretical and practical insights on the process of internationalization.

In Chapter 4, titled “How Can Information Systems Improve Sustainable Procurement Policies?,” Allal-Chérif focuses on how information systems can contribute to the development of a sustainable procurement policy. He argues that the integration of strategic suppliers, the collaboration with them, and the interconnection of processes are achieved through information and communications technol-
ogy tools. He shows that with information systems buyers can monitor suppliers and coach them in improving various indicators, especially ethical and ecological ones. A company with a sustainability ambition should have sustainable suppliers and efficient information and communications technology tools to analyze and manage ethical and ecological issues. Information and communications technology not only offers us an opportunity to redesign and deliver the widespread benefits of technology to the most remote location, but it also offers us a new approach to Sustainable Development. The purchasing function acts as a pioneer in developing new forms of internal and external collaborations and adopting a partnership approach with all key suppliers in order to successfully address the current economic crisis and prepare to emerge from it. Sustainable procurement lies at the heart of the new corporate sustainable strategy of modern firms. Managers rely on purchasing information systems to construct, disseminate, and pilot sustainable purchasing policies. Sustainable development has become a major organizational performance criterion, an indicator of the purchasing function’s maturity, and a broadening of the concept of total quality. It involves the development of new digital collaborative platforms enabling practices that are more in line with the green mindset with which companies would like to associate their image. This study helps to determine paths toward a sustainable management of the purchasing function due to the use of purchasing information systems that are more open, integrated, collaborative, and project-focused. The author explains that among other tasks, buyers must ensure that suppliers adhere to an industrial policy that is compatible with sustainability principles. For this, buyers increasingly rely on different sorts of purchasing information systems. The awareness is rising that collaboration comprises a major strategic issue enabling people to capitalize on knowledge, ascertain joint projects, and guarantee the financial viability of all commercial partners. Customer and supplier firms must have compatible cultures featuring common strategic objectives and values that they all promote in their dealings with other actors in the market.

In Chapter 5 titled “Strategic Turning Points in ICT Business: Re-Valued Case of Nokia,” Rusko focuses on the mobile phone industry and its technologies, strategic processes, and turning points. He defines the concepts and meanings of strategy and describes the history of Nokia and more generally the development of the whole mobile phone branch. He then conducts a strategic analysis over the turning points of Nokia. Finally, he concludes with some analysis of the mobile phone contemporary markets.

In Chapter 6, titled “Holistic View on Unknown Unknowns in Project Risk Management,” Raydugin outlines a practical recipe for handling unknowns in project management. He discusses four dimensions of project unknowns: novelty of a project, phase of project development, type of industry, and bias. He puts forward practical recommendations on addressing unknowns with probabilistic cost and schedule. He also provides discussion on unknowns vs. corporate and technology risks. He also introduces a special type of corporate risk stemming from focused activities of project stakeholders (“broiler black swans”).

In Chapter 7, titled “Exploring the Secret of Successful University Brands,” Chapleo explores commonalities in brand-related activity among universities identified as having successful brands. These included reputation, progressiveness, professionalism, accessibility, and corporateness. He argues that the application of branding to areas other than commercial product marketing is increasingly relevant in terms of practice and now attracts considerable resources. He examines the literature and the concept of successful brands. The research approach he utilizes in this study involves generating constructs to determine what underpins a successful brand, and subsequently testing these among a larger sample size.

In Chapter 8, titled “ERP Misfit-Reduction Strategies: When are System Modification and Organizational Adaptation Appropriate?,” Shiang-Yen shows that the misfit between Enterprise Resource Planning (ERP) systems and businesses is widely recognized as the main cause of ERP system failure.
He empirically examines to what extent the two misfit-reduction strategies, namely system modification and organizational adaptation mitigate the negative impacts of ERP misfits on ERP system performance, which is measured by information quality. Questionnaires are collected from the ERP system users in the manufacturing sector and analyzed using the structural equation modeling approach. His study reveals that the effects of the two misfit-reduction strategies vary based on the different characteristic of ERP misfits. Specifically, system modification is found to significantly reduce the negative impact of deep-structure misfits, such as process misfits, whereas organization adaptation is significant in mitigating surface-structure misfits, such as data presentation and layout. This study advocates the notion that there is no deterministic better misfit-reduction strategy, but the selection appropriate misfit-reduction strategy is dependent on the different natures of the ERP misfits. This notion also implies that ERP misfits have a variety of characteristics that set them apart, and these characteristics render different effectiveness of the misfit-reduction strategy. He finds that different types of ERP misfits, namely input misfit, process misfit, and output misfit, have different impacts on the performance of ERP systems. He concludes that input misfits and process misfits are found to have significant negative impacts on information quality, whereas output misfits are not found to have significant impact on information quality. Moreover, the negative impacts of process misfits are shown to be greater than input misfits.

In Chapter 9, titled “An Integrated Model of Success in IT Outsourcing Relationships: Implications for the Public Sector,” Duhamelm, Gutiérrez-Martínez, Picazo-Vela, and Luna-Reyes propose a series of dynamic interrelationships among trust, knowledge, commitment, and interfaces and show five scenarios that highlight the key role played by the quality of interfaces in the information technology outsourcing relationship. The role of trust in their model is consistent with the social exchange theoretical perspective: one party will have a behavior that reciprocates the other’s behavior. Their research shows that, in a provider and outsourcer relationship, high levels of trust on both sides enable high levels of commitment on both sides, which improves the project’s productivity. The role of knowledge sharing in achieving success in outsourcing relationships is also confirmed in their research, as the results indicate that knowledge sharing between the provider and the outsourcer leads to more effective work. The study also shows that a good level of knowledge about one’s own practice and good interfaces can help to overcome initial distrust. They show that the exchange of knowledge that occurs between the outsourcer and the service provider has a practical importance in the relationship since, beyond the mere execution of the service, both partners must maintain a constant flow of information, share experiences, and propose improvements to the quality of the service. In addition, outsourcers, even though they are not in charge of executing the tasks in the outsourcing contract, must reorganize their internal teams to play a monitoring role. This role supposes the capacity to measure the performance of suppliers and to retain sufficient knowledge to be able to back-source the activity or transfer it effectively to another supplier if the existing supplier fails. Their work contributes to the information technology outsourcing literature and to the system dynamics literature by examining the dynamics of outsourcing relationships between outsourcers and service providers under the lens of knowledge sharing.

In Chapter 10, titled “Business Process Complexity, System Complexity, and Perceived Audit Quality: An ERP System Perspective,” Nwankpa argues that the veracity of audit reports has attracted various stakeholders in an attempt to understand series of business failure and corporate scandals. He examines how auditors perceive changes created through ERP system implementations in an effort to understand audit quality. His study reveals that there are significant changes in perceived audit quality due to auditors’ perception of change created by ERP deployment. Specifically, system complexity, audit process changes, and control risks are identified as key antecedents to auditors’ perceived auditor quality. This
means that there is a need for auditors to evolve to accommodate the ERP challenges as more companies implement ERP systems. In addition, this study shows that control risk issues remain at the heart of an ERP audit exercise. With ERP systems arguably ushering in business process improvements, it is revealing to note that such process improvements does not always transcend to audit process efficiency. Auditors are still concerned with what lies underneath these business processes, and with no concerting effort from organizations, it comes as no surprise that auditors feel increased control risk in post-ERP implementation. At the same time, system complexity embedded within an ERP system requires auditors to untangle these layers of system complexity prior to forming an opinion on the adequacy of internal control systems.

In Chapter 11, titled “Modeling Choice between Competing Technologies: A Comparison of Mechanisms and Information Integration,” Aguirre-Urreta compares two levels at which the choice can be made—expectations and intentions—and then reviews and contrasts four different comparison mechanisms that can integrate the evaluations made at each level as predictive of actual choice. He investigates these points by asking business professionals to assess and evaluate technologies for potential adoption within their domain of expertise, and then he conducts a second study to further validate the results. He also extensively discusses the implications of this research for future work on the processes leading to adoption of information technologies.

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