The Complete Guide to Knowledge Management

A Strategic Plan to Leverage Your Company's Intellectual Capital

EDNA PASHER AND TUVYA RONEN

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To Margalit, whose love, patience, and wisdom accompanied me in this journey for Knowledge Management as in all our travels on the roads of life.

—Tuvya

To Yossi Pasher, who has been supporting me to grow our intellectual capital and make my dreams come true, with love.

—Edna

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We thank all of our friends in the Intellectual Capital Pioneers community, who opened our eyes to new possibilities.

—Edna

I would like to thank the people of Rafael, my mentors, colleagues, and personal friends during my professional career. Their friendship, dedication, and knowledge were the inspiration for this book. I began this knowledge management journey to bring us some of the lessons learned in the outside world, to find that we have much of our own to contribute to others.

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—Tuvya

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—Edna and Tuvya

Preface

Getting Started on Your Knowledge Management Journey

Welcome to the beginning of your knowledge management (KM) journey. On this journey, you will travel with us, Tuvya and Edna, two KM experts searching for successful solutions to various KM issues in all types of markets and situations. This book takes the intangible and abstract topic of KM and makes it concrete and applicable.

Most managers already know something about KM and are curious to learn more, but their initial backgrounds may differ considerably: Many have only heard *knowledge management* used as a buzzword; some may hold the common misconception that it is only about systematically recording existing knowledge; and still others have already realized its strategic value. All of them, however, share a common goal that renders them prospective experts: to fully understand KM, to know their role in implementing it, and to acquire the necessary skills and tools for doing it successfully.

A Book for Managers

This book is intended to prepare managers to be the leaders of KM in their organizations. The continuous growth of knowledge, the most important core competence of the modern organization, ensures the long-term growth and profit of an organization. Managers at all levels of the organization must be the leaders and catalysts of KM. It is the manager who must comprehend and exploit the strategic significance of knowledge by instilling the processes of knowledge creating and knowledge sharing in an organization's culture and, in particular, continually fostering innovation.

While managers must learn to be KM leaders, most books on the subject do not address their special needs. This book aims to fill that gap. It addresses all manners of KM topics and takes managers on an intellectual journey into knowledge management.

We begin our journey by establishing the business case to justify KM as a tool to increase the *intangible* asset of intellectual capital, which in turn ensures the *tangible* assets of future financial success. We then link strategy and knowledge management, and describe how to establish an appropriate KM culture geared toward constantly creating new knowledge.

We then take the manager along through a variety of focuses that represent the different topics of knowledge management, from the human aspects of managing knowledge workers, promoting interactions for knowledge creating and sharing, to knowledge-capturing processes, exploiting customer knowledge, and measuring the performance of increasing intellectual capital.

The peak of our journey involves knowledge renewal and the role of the manager in fostering innovation (the new use of existing knowledge and the creation of new knowledge).

Introducing the Authors

As authors, our background is particularly suited to understanding and fulfilling the unique needs of managers engaging in knowledge management. Dr. Tuvya Ronen is a vice president at Rafael, a leading aerospace company in Israel, where he gained extensive experience in managing research and development teams in projects and in professional departments. Dr. Edna Pasher is a strategic management consultant, an international pioneer in the intellectual capital community, and a leader in implementing knowledge management in Israeli organizations. We both have extensive experience in practicing knowledge management in organizations and have gained a deep familiarity with cutting-edge developments on the subject. While we have teamed together in writing this book, we represent different but complementing experience and perspectives.

Moreover, throughout the book, we also contribute our unique experience as authors, managers, and consultants living and working in the country of Israel, a small country always struggling to compensate for its lack of physical resources by utilizing successful KM strategies. In recent years Israel has established itself as a knowledge country, with economic success. The land of "the People of the Book" is now commonly referred to as "the Second Silicon Valley" or "the Start-Up Nation." Israel was one of the first countries to emerge from the 2008–2009 world financial crisis.

There is a growing interest in its story of successful KM on a national level, and Edna is often invited to tell this story at international KM conferences. We therefore have many examples to share from the Israeli history of excellence in creating intellectual capital (IC) out of KM.

In particular, Tuvya's experience at Rafael has proven striking in providing examples for this book. Rafael has intuitively created a legacy of KM practices that began during a time when the term had not even been invented. The stories we present here from Rafael and Israel, combined with the other extensive global examples, create a comprehensive assembly of numerous nonstandard cases that managers can analyze and utilize. These cases include both large and small companies and are likely to be relevant and refreshing for readers (even those who already have some experience in KM).

Each of us experienced, in his own field, the major consequences of the two most recent economic bubbles: the first in early 2000 and the last beginning in 2008. We make a point of discussing KM examples as influenced by these bubbles.

How This Book Is Organized

We have structured this book to help you understand and implement a systematic and comprehensive knowledge management process. The chapters guide you in this journey, and—except when indicated otherwise—are helpful to read in order of appearance.

The KM journey follows a spiral path, as shown in Figure P.1. It does not terminate at the peak, since effective knowledge management is a continuous and never-ending process; rather, the end is a new beginning in a continuous journey, leading an organization to ever-higher peaks. Figure P.1 depicts the four phases of this journey, which we describe as follows.

Phase 1: Hitting the Road

This book begins with Chapter 1, "The Motivation toward Knowledge Management: Combining the Tactical with the Strategic," which presents the basic managerial catalysts for the journey into knowledge management: the questions, issues, and solutions involved. Most managers acquire their interest in KM while discovering tactical KM problems of knowledge capturing and knowledge sharing. They later realize the strategic importance of knowledge as the basic asset of the modern organization. In this chapter, we discuss both the tactical and strategic aspects of KM by providing easy-to-follow examples.

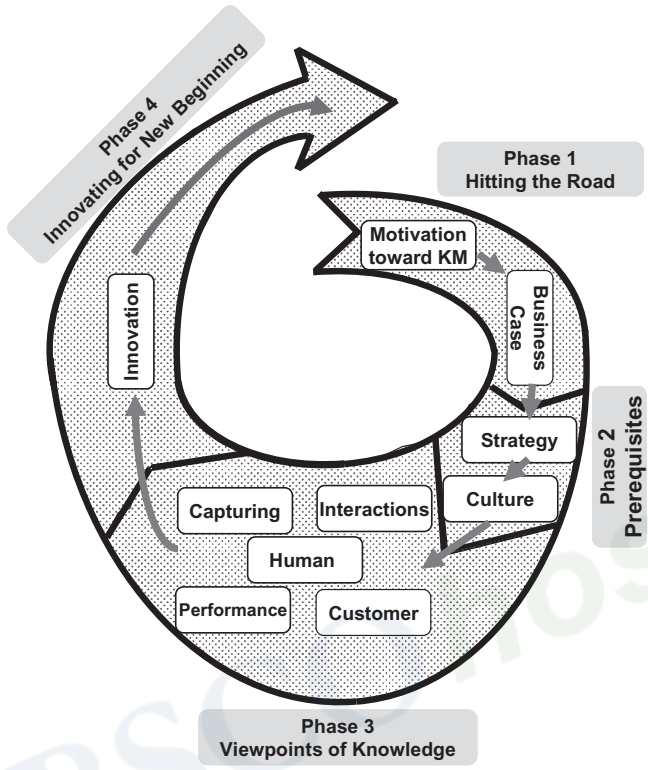

FIGURE P.1 The Knowledge Management Journey

Chapter 2, "Making the Business Case for Managing Intellectual Capital," explains how a manager can solidify the business rationale for investing time and money in knowledge management. Knowledge management aims to increase the tangible assets of an organization by increasing its intangible assets (the intellectual capital).

Phase 2: Prerequisites

Prior to starting the journey to successful knowledge management, managers and organizations must consider two essential prerequisites. First, managers must establish a comprehensive business strategy (composed of a vision, a mission, and a strategy to implement it) and knowledge management must serve that strategy. Chapter 3, "The Importance of Strategy in Knowledge Management," emphasizes the tight coupling between knowledge management and strategy.

Second, knowledge management hinges on developing a system of shared values and a management style that seeks and develops an employee's knowledge. This management style is based on a culture of trust, innovation, and respect for the knowledge of the workers. Chapter 4, "The Role of Culture in a Successful Knowledge-Creating and Knowledge-Sharing Organization," explains and advocates these cultural requirements.

Phase 3: Viewpoints of Knowledge

Phase 3 presents critical viewpoints on knowledge management that you should consider for your organization. Chapter 5, "The Human Focus: Understanding and Managing Knowledge Workers," discusses how the success of a knowledge company is based on the proper management of its knowledge workers. It shows how to make an organization attractive to knowledge workers so that they will be motivated to join the organization and stay with it. It describes tools for enlarging the workers' knowledge and encouraging them to contribute their knowledge to a management process. This chapter is distinguished from the abundance of literature on human resource management in that it focuses specifically on knowledge issues and knowledge workers. We analyze lessons learned from the two bubble economies on successfully managing, attracting, and retaining knowledge workers and their knowledge.

Chapter 6, "Managing Interactions for Knowledge Creation and Sharing," discusses how knowledge is created and shared largely by social interactions. This chapter provides readers with methods to promote positive interactions to foster knowledge-creating and knowledge-sharing communities in their organizations. It provides a detailed discussion of formal and informal techniques that provide the cultural and physical environment for these communities to prosper.

Chapter 7, "Capturing and Reusing Knowledge," presents methods for capturing and codifying existing knowledge in the organization and making it available to any number of potential users.

Chapter 8, "The Customer Focus: Harnessing Customer Knowledge through Meaningful Interactions," presents opportunities and methods for making customers partners in creating knowledge and in shaping an organization's future. As the chapter details, customers possess a lot of valuable knowledge and are often willing to share it if an organization has the will and resources to inquire, and to co-create knowledge with them.

Chapter 9, "Measuring and Managing the Performance of Proper Knowledge Work," provides readers with the appropriate measurement systems required for effective knowledge management of the intangible asset of intellectual capital. These are added to the classical accounting methods indispensable for effective management of tangible resources.

Phase 4: Innovating for a New Beginning

In Chapter 10, "Innovating for a New Beginning," the journey has one mandatory stop before it can begin anew: knowledge creation through innovation. Constant innovation in all business activities is a must for the continuous survival of an organization. This chapter describes various techniques for fostering a culture that encourages and enables workers to innovate.

And finally, the last chapter, "Conclusion: Implementing Knowledge Management—A Step-by-Step Process," outlines practical steps for readers to begin to implement proper knowledge management, particularly identifying where and how to begin the process in one's own organization.

Notes on Style

Before concluding this preface, we would like to draw the readers' attention to some particular styles used throughout the book:

Referencing the Authors and Sources

Our policy in referring to us, the authors, represents our combined message as well as our different perspectives. We usually refer to ourselves in first person as "we." However, in many cases we refer to "Tuvya" or "Edna" in the third-person. This is done mainly to emphasize his or her particular experience or point of view, but sometimes even to present disagreements between us.

We have two different policies in referring to people mentioned in the various examples. In cases based on interviews with managers and KM experts, or on written sources, we make every effort to cite them accurately with their name and their title at the time of interview. In other cases based on our personal experience, where people are mentioned without being interviewed, we substitute first names to respect their privacy. In both cases, any interpretation is our responsibility.

Definition of Knowledge and Intellectual Capital

This book is about knowledge and intellectual capital, and we have used these terms freely without asserting exact definitions. While expecting the context and your experience to make them clear, we offer this simplified definition: *Knowledge* is the experience and expertise that, when combined with basic data and information (which are not discussed here), can solve problems and create value. This value is the *intellectual capital*.

More thorough definitions of these basic terms (data, information, knowledge, intellectual capital, and wisdom) are quickly described in the Appendix at the back of this book. This appendix may also serve as an alternate approach for introducing the subject.

Conclusion

When you have read all the chapters of this book you will have a complete guide to knowledge management. Next, you are able to start implementing the different methods you learned in your organization (or department, or team—remember that KM can be used at any level!). Our hope is that this book will take you all the way from strategy to implementation and that you will see the very tangible results of success in a number of ways. To that end, each chapter finishes with a list of seven guidelines (which we call "The Magnificent 7") to help you remember the most important points of the chapter's subject.

Good luck!

CHAPTER 1

The Motivation toward Knowledge Management

Combining the Tactical with the Strategic

In this chapter you will:

- Review examples of typical tactical knowledge management problems.
- Discover how knowledge management is actually a strategic tool aiming to increase the intellectual capital essential for long-term success of an organization.
- Learn that the manager should lead knowledge management efforts in an organization because of its importance as a procedural tool with both tactical and strategic relevance to success.

Most managers, when they begin this journey into knowledge management (KM), do not even know what knowledge management entails. They are only familiar with some of its problems from their day-to-day experience with the flow of knowledge in their organization. These day-to-day experiences are considered *tactical*, meaning they interfere with an organization's efficiency and performance. An example of a tactical issue might be that a manager notices a worker or colleague is not open to sharing his position's knowledge, so the manager needs to reinvent processes that already exist.

Later, when managers become more involved in learning about successful knowledge management, they realize the tactical problems also have *strategic* implications and solutions that can further the intellectual capital of their organization overall. For instance, modern high-tech organizations use KM to align their research and development (R&D) efforts. Or traditional industries realize that KM helps them use their current core

competencies, or develop new ones, in order to quickly invest in new products, services, and solutions that the market needs. Simply put, effective KM will turn any organization into a fast-learning one, geared toward a sustained, competitive advantage.

Once managers realize how important knowledge management is overall, they begin looking for help but often are not sure how to implement the proper plan.

This chapter begins with an account of some of the challenges that led the authors on their personal KM journeys. The challenges described here use examples of KM problems, all of which are typical of what readers might encounter in their business. The chapter continues with responses to these challenges and ends with some universal truths about KM issues, paving the way to the more detailed discussions found throughout this book.

A Manager Struggling with Key *Tactical* Problems

Co-author Tuvya Ronen became aware of KM problems in the late 1990s. Tuvya is now a vice president at Rafael Advanced Defense Systems Ltd., where he manages an R&D center of about 1,500 engineers and scientists. Rafael is a leading aerospace company in Israel—with $1.6 billion in annual sales and about 6,000 employees—whose products are based on an intensive use of innovative R&D. Tuvya has spent most of his career at Rafael.

Basically, the goal of an R&D center at Rafael, as in any organization, is to create and disseminate knowledge. Unknowingly, Rafael has established a unique knowledge culture that utilizes several first-class KM methods. However, some changes over the course of Tuvya's time at Rafael have challenged its ability to increase efficiency and competitiveness. To his dismay, Tuvya found that this was an ongoing process: New knowledge problems were always emerging where none existed before.

The following examples describe some typical problems that Tuvya first encountered in the late 1990s, when he was managing one of the departments of the R&D center at Rafael.

Ben's Bright Idea Surprisingly Rejected

Ben is a leading member of a team of aerodynamic designers. Their work requires using several different codes for estimating aerodynamic properties, such as lift and drag. Ben made an obvious and simple suggestion: Whenever somebody uses a code, he should write comments detailing the experience. These comments would be useful for

others: determining which code suits a specific family of configurations or flight velocity, bug alerts, and so on.

In the old days, this suggestion would have been hailed by workers and managers alike. Surprisingly, objections sprang up like mushrooms after the rain: Why would an employee want to spend time for the benefit of others when tight schedules and deadlines pull him back to his work? When and why would coworkers read the comments? Who would sponsor the extra work? Where would the money come from in light of tight budgets and narrow profit margins?

The main issue presented in this example is: How can employees learn from each other when they don't have the time, money, or managerial attention? Is Ben's idea the best solution? Are there other, better solutions?

Nathan, the Irreplaceable Technician

Nathan is a veteran technician but the organization decided to encourage him to seek early retirement. The situation seemed win-win: He would enjoy a generous retirement package and his department could replace a not-so-cutting-edge technician with an aspiring, young engineer.

Unexpectedly, it turned out that Nathan was irreplaceable as he was the sole source of knowledge in his position. Specifically, only he knew how to maintain an old simulator that was essential to the department's work. Before the decision to ask him to retire, his coworkers had no interest in the old simulator with outdated technology so they did not hasten to acquire his knowledge before encouraging his retirement.

The main issue presented in this example is: How can an organization avoid a situation whereby a single person holds all the knowledge about a key subject?

Ron's Knowledge Leaving the Organization

Ron is a senior veteran engineer who has held various management positions. Through the years he has become a walking encyclopedia about the design and operation of a family of products. Everybody likes

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to hear his view. Even younger engineers, who consider him old-fashioned, ask for his advice if only to do the opposite.

In the old days, everybody knew about Ron, and felt he would always be a part of the organization. Nowadays, his fame has declined and many people do not know about his expertise. He may even retire or move to another organization.

The main issues presented in this example are: Can Ron's knowledge about existing products be documented? Is it possible to create an expert system, using the knowledge of Ron and others, to advise us about new projects? How do we identify important sources like Ron for other workers to use? Are there similar useful sources hidden from the other workers' experience?

Tuvya assumed that he was not the first person to encounter these types of knowledge issues within an organization. He wanted to find out how other organizations, both in Israel and globally, had solved them. He decided to dedicate a generous amount of time to searching for successful answers and will share many of them with you throughout this book.

A Consultant Struggling with Key *Strategic* Problems

During Tuvya's search he was introduced to co-author Edna Pasher, a management consultant. Whereas Tuvya was struggling with KM problems on the *tactical* level, Edna was grappling with KM issues on the *strategic* level.

Edna draws from her academic background in organizational communications to guide organizations in strategic renewal processes. Since the 1980s, she has adopted the approach outlined by Hammel and Prahalad,[1] whose focus of strategic processes is to identify the core competencies of an organization that will lead to a sustained competitive advantage. Once these competencies are agreed upon, the question becomes how to develop them in the most effective and efficient way. In order to ensure a sustained competitive advantage, the core competencies—or in other words the core knowledge—should be developed, upgraded, and improved in order to generate a higher return.

Since 1994 Edna has tackled the task of exposing executives to the emerging field of knowledge management. She realized that viewing knowledge as the heart of the competitive edge of organizations implied that knowledge management and strategic management must go hand in hand.

A good example of the power of strategy working in concert with proper KM is IBM Corporation. Its success over the years has relied on a unique combination of technological and business management innovation. IBM allocates billions of dollars of R&D investments to create unique products and adapts them to the changing needs of the market. Further, it develops core competencies in business innovation to influence those market needs. We can see this at work when we think about how IBM was first on the market in creating PC hardware, but then got out of it for more profitable activities later on.

We present a more detailed description of IBM in Chapter 3, but we mention it here as a powerful example of knowledge management and strategic management going hand in hand. In spite of such an obvious model, it is still difficult to persuade managers to take a serious look at strategic KM. The following stories further describe Edna's experiences.

Convincing Managers about the Importance of Strategic KM

When leading strategic processes in organizations, Edna observed that it was very difficult for managers to "think outside the box." It was hard for them to be creative and innovate faster than their competitors. Sometimes managers were better able to incrementally improve what they'd already done rather than to dare to embark on a full paradigm shift.

Edna found that it was extremely difficult to convince managers that knowledge management is a worthwhile pursuit. It is a difficult business case to make because tangible results can take years to come to fruition. Managers of public companies are particularly pressed to show results on a quarterly basis, so they don't often see the results of knowledge management overhaul quickly enough to put the initial effort into perspective.

Even though thinking about strategy at the outset of major tactical changes is a difficult case to make, sometimes Edna is successful, as the following examples show.

Arkia: A Strategic KM Transformation

In the early 1990s, the Israeli domestic airline Arkia was a 40-year-old company, which always did more or less the same thing. It operated domestic flights in Israel and flew short-range international charter flights. The company seemed to be sleepwalking through its processes for many years without change. But when the company managers took a look at their business in terms of strategic KM, a transformation came about.

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They used the tactical methods of knowledge-creating interactions to gain insight into the experiences of managers and employees. They then arrived at a strategic decision to better exploit existing core competencies. In this particular case, instead of selling vacation packages only on a small scale to accompany flight tickets, they decided to use that capability to make the airline a major tourism company. The result was a major increase in revenues and profits.

The main issues presented in this example are: How to achieve a strategic transformation based on knowledge and core competences (which we detail in Chapter 3)? What are the tactics to produce knowledge creating interactions (which we describe in Chapter 6)?

Danya Cebus: A Construction Company Going Public

Picture this: It is the technology boom of the late 1990s and enthusiastic investors are abandoning the old economy for the lure of high-tech profit. How do you convince potential investors to buy shares in your construction company during a recession in the construction industry?

This was the challenge faced by Danya Cebus, a leading construction company in Israel. Their strategic problem was raising the company's value in a difficult market in preparation for going public. They needed to convince potential investors that they had the possibility for future growth and were just a high-tech company in an old-tech industry. With this in mind, they asked themselves, how does Danya Cebus present its core competencies and demonstrate that it can ensure a sustained competitive advantage in a fast-changing industry?

Although a construction company technically belongs to the old economy, knowledge management turns out to be a relevant tool for addressing their strategic question. They faced the task of presenting their strategic advantage by tallying their knowledge assets and knowledge management practices. Their solutions to staying competitive are presented in Chapter 9. The changes led to successful results.

Holon, Israel: A City Reborn

Cities need to move to knowledge-based development, too, just as organizations do. The city of Holon in Israel had to reinvent itself as it became less attractive to future generations of Israeli citizens. In 1993, a new mayor and CEO started a well-documented renaissance process in the city and the story has become an example recognized worldwide.

The city managers started with a singular vision: Make Holon "The Children's City," thus making it attractive to young families again so they would want to stay there. This strategic focus was then translated into many projects and programs across the area, involving major efforts to turn Holon into an attractive city complete with an intellectual capital (IC) report to visualize all the efforts of the transition.

In 2007, after 15 years of building, the city moved in an Israeli rating[2] from number 15 (last in the rankings of the Top 15 Israeli cities) to number 6. In 2010 its mayor was named one of the world's top 10 mayors by a UK magazine.[3] All it took was a strategic approach from a singular vision. The city's managers followed processes of proper knowledge management toward increasing the city's human capital, thereby enriching its intellectual capital and, in turn, its long-term growth.

These examples demonstrate the broad spectrum of knowledge-based strategies and tactics that apply not only to corporations, but also to many not-for-profit organizations.

A Convergence of Paths

When we (Tuvya and Edna) first met during the late 1990s, our initial discussions produced three conclusions:

1. Tuvya was not alone in searching for tactical solutions.
2. The search for strategic solutions was an even more important step toward proper knowledge management.
3. The search for answers to proper knowledge management is a common journey.

In the rest of this section we elaborate on these conclusions and their significance to our further common work.

Tuvya's Questions Are Typical Tactical KM Issues

Not surprisingly, our first conclusion upon meeting was that Tuvya's knowledge problems were not unique but universal. The problems at Rafael were typical examples of tactical questions in knowledge management:

- How can an organization enhance its knowledge creation?
- How can it preserve its existing knowledge?
- How can it encourage its knowledge sharing?
- What are its most efficient methods of knowledge dissemination?

KM Has Important Strategic Implications

Our second conclusion was motivated by Edna's experience that most managers are initially exposed to KM issues through tactical aspects, but eventually discover that KM has strategic implications that are even more valuable to their long-term goals.

When we met, there were substantial restructurings happening at Rafael. The main change was that Rafael was transitioning from a government organization into a commercial company, in turn emphasizing profitability. Part of the change involved instilling a different system of work contracts. The measures implemented were expected to have positive effects: streamline the organization, decrease operational expenses, and increase efficiency and profits. Then, hopefully, they would lead to better financial results and increase the tangible financial capital of the company.

But the initial expectations should have been further examined from a knowledge management point of view. The changes they were looking for may have led to changes in culture and values, some of which could have influenced worker motivation to create and share knowledge, or even to continue working at the company. In Chapters 4 (regarding culture) and 5 (concerning the human focus), we discuss these kinds of issues and show how Rafael successfully solved them, thus avoiding the need for a second wave of overhaul.

These types of moves for change should raise basic questions regarding identifying the existing knowledge assets of an organization and how to effectively exploit them in a new structure. All these considerations are part of what we call the *intellectual capital* (a term invented in the 1990s—for example, Edvinsson[4] or Stewart[5]—to include all intangible assets that are necessary in the present to assure continuous future success of an organization). Eventually, and fortunately for Rafael, we found that after a decade, the results for Rafael were very successful and carried with them very important lessons. We describe these lessons in Chapter 3 on strategy.

Strategic KM questions that would be helpful for organizations to ask, though, before making sweeping structural changes—questions affecting the intellectual capital of an organization—include the following:

- Are the culture and values at an organization right for a properly knowledge-savvy organization?
- What are the knowledge assets of the organization?
- How can the organization leverage its assets for better results?
- How can it increase its assets in the long run?

These strategic questions are always important overall, but they are even more sensitive in times of turnover and restructuring. Actions leading to short-term gains in financial capital may induce major losses in intellectual capital in the long run if questions like these are not considered. These losses will eventually hamper financial results over time if managers do not take them into consideration as early as possible.

We Would Like to Join Forces in Search of Answers

Our third conclusion upon meeting was that KM questions, both tactical and strategic, are vital to the future success and sustainability of any organization. Hence we want to join forces and embark on a common journey to search for answers.

Discovering Universal KM Truths

We began this journey to discover how KM questions are answered around the world. It began as an actual journey of several months, visiting organizations and consultants who were leaders in KM globally at the time. Our journey then continued as a more comprehensive study of what is actually done, both worldwide and in our home of Israel and especially at Rafael. Our travels have lasted more than a decade, covering ups and downs in the economy (including two economic crises, or so-called bubble economies) and in all types of organizations. Now we would like to share with you the lessons of our journey, beginning with some of the basic answers to some of the basic questions.

The Answers Are Important

We have found that knowledge management solutions always have benefits for an organization. With this in mind, the reader should realize that KM has not yet become a mature discipline. While many organizations are doing

well with KM initiatives and processes, there are many others that still need to improve. So it is not enough that people, teams, and organizations are aware of KM issues and solutions. We still need to broaden the various methods involving KM and make its practice even more widespread.

As we've said, in the years since our research began, we have witnessed two economic crises that put KM to the test. The first was in the early 2000s: the technology bubble crisis (or dot-com crisis) in what is now called the new economy or the knowledge economy. Many high-tech companies collapsed at that time, shattering with them many investor hopes and raising doubts about the validity of claims concerning the worth of knowledge-based organizations. This might have led to a misconception that the knowledge economy was finished, but time has proved the opposite. It is true that in the days of the inflated bubble economy, it was difficult to distinguish which companies had genuine intellectual capital and which ones were just claiming to have it. The ones with real IC and effective knowledge management survived and prospered. (In particular, we looked very closely at our home economy in Israel as a good laboratory in which to review case studies of both of these bubble economies, because of Israel's small-scale economy but large-scale start-up culture, and found this to be a common thread.[6])

The second economic crisis occurred in 2008 and has not yet ended. Unlike in the first crisis, knowledge management practices were not to blame in the second. Instead, most professionals agree, the second crisis was more the result of gross financial blunders combined with greed and fraud. However, of the organizations and regulators that have made a comeback and survived since 2008, it's obvious the ones with a better understanding of their organization's knowledge management processes—and better IC—were quicker to rebound than the competition.

These two bubble economies were a magnifying glass with which we could watch the delicate relations between knowledge organizations (KOs) and their knowledge workers (KWs) as they reacted to pressure-filled situations. Because human capital (which creates intellectual capital) is so important to proper knowledge management and, in turn, long-term growth, we dedicate several sections in this book to analyzing the issues of an organization's culture and its human resources.

The Answers Are Diverse

Overall, our quest for the best practices in knowledge management was motivated by both tactical and strategic issues, and the answers we found covered a wide spectrum of the life of an organization: from understanding business models and creating the right culture to human resources and reviewing day-to-day operations of knowledge creation and

capturing. Developing a successful system of knowledge management requires a manager to pay attention to every step in the process of an organization's work.

However, because there are so many steps in the process, we tried to stay focused and limit ourselves to the issues most directly relevant to proper knowledge management, including culture, interactions, customers, and innovation. Nevertheless, keep in mind that KM still covers many more aspects than are covered in this book.

We also found that for each aspect we do cover, there is a great diversity of methods for successfully moving toward effective knowledge management. We aim to present the diversity of these methods with as broad a perspective as possible from what we learned worldwide and at home.

Some Answers Can Be Found Close to Home

Another answer we came to was that there was much to learn from organizations near our home. Tuvya, for example, was impressed by what he saw when he visited successful knowledge-managing organizations around the globe, but also learned to appreciate the ways that his own organization does KM: Rafael had been managing knowledge throughout the years, sometimes without even knowing that's what they were doing.

As is the case with many organizations, the founding fathers of Rafael and its workers didn't start out using the term *knowledge management.* They simply knew they needed an excellent R&D organization in order to prosper, and fortunately they succeeded in creating the basics of a knowledge culture—even without knowing that was what they were creating. They adapted their business to changes in the environment over the years, so the culture at Rafael came to consist of many important ingredients that can be used as an example for other organizations.

Expanding this example to our home country, Israel, there is also much to be learned. Israel, a country with no natural resources, must rely on its intellectual capital to survive. This IC is manifested in a start-up spirit that has been documented in literature[7] and through some important KM practices in Israeli organizations. We therefore feel that Israel, and Rafael especially, have a lot to offer as case studies in this book, and we mention them throughout.

While we are boasting of our home, we are sure that your own home organization has some good KM practices, too. While you are probably looking to make KM improvements in your organization, it is also important to notice and understand what you already have. It is a good basis for implementing changes so you do not inadvertently spoil what successful KM practices you already have while you make improvements.

The Manager Must Lead

We hope you keep in mind that knowledge management is the concern of *every* manager. It is not some side issue that may be left solely to chief knowledge officers and management consultants. Knowledge is the most important asset of a modern organization. Only continuous growth of knowledge ensures long-term growth of profit and the tangible capital of an organization. The manager, at all levels of an organization, must be the leader and catalyst of knowledge management. It is the manager who must comprehend the strategic significance of knowledge, instill the culture and processes of creating and sharing knowledge, and, in particular, continually foster innovation (the creation of new knowledge).

This is where you, the reader, come in. Most likely you already know something about knowledge management but are curious to learn more. Many of the problems we describe and address in this book will be familiar to you. We hope to provide you with insight by presenting the methods used by cutting-edge knowledge-managing organizations and to convince you of the importance of proper knowledge management in ensuring the success of your organization. We also wish to provide you with the tools and the plan to implement the proper cultural environment for enhancing the creation and sharing of knowledge within your organization.

Conclusion

This chapter has exposed you to some of the challenges of tactical and strategic knowledge management issues. We have given you some initial answers to a few basic problems and will now continue to lead you on a KM journey by delving into the details. In Chapter 2, we discuss the business reasons for putting time and energy into increasing intellectual capital, the ultimate goal of proper knowledge management.

The Magnificent 7

1. Knowledge is the most important asset of a modern organization.
2. Knowledge management has many important tactical issues, and most managers are initially exposed to KM through these aspects.
3. Knowledge management has strong strategic implications on the organization, and the tactics should be derived from them.

4. Knowledge management is relevant for all types of organizations: small and large businesses, all types of industries, and not-for-profit organizations.
5. Knowledge management should be led by managers at all levels of an organization.
6. There are many diverse methods for knowledge management. Organizations can learn from each other, beginning by realizing what already exists in their own home.
7. Knowledge management is a constant process, whereby processes of creating, sharing, and capturing knowledge should be continually repeated and refreshed.

CHAPTER 2

Making the Business Case for Managing Intellectual Capital

Wisdom exists only in those things that are hidden from the eye.
—Jewish proverb, circa third century

Anything essential is invisible to the eyes.
—Antoine de Saint-Exupéry, *The Little Prince* (1940)

In this chapter you will:

- Learn about intellectual capital and its importance to managers in the form of valuing intangible assets.
- Understand why increasing and managing intellectual capital is essential for the long-term prosperity of knowledge organizations.
- Understand why knowledge management is first and foremost about managing and increasing intellectual capital, and how it serves as the basis for all knowledge management tools.

While you may assume so far that knowledge management is important, you still have to convince yourself and your managers about its tangible contribution to your business. You will grapple with questions like, "Intellectual capital is an intangible asset and does not appear in the conventional financial reports, so why bother with it?" This chapter helps to build the business case for investing your time and money into the proper knowledge management systems.

Intellectual Capital as the Basic Asset of a Knowledge-Intensive Business

We have already mentioned that intellectual capital (IC) is the most basic asset of the knowledge organization, essential for ensuring the sustainable

success of an organization and continuous growth of its tangible financial capital.

The concept is not immediately understood, so instead of honing our definitions, we will explain it by using several examples from different industries.

Example: AFS, a Skandia Subsidiary—A Company in the Red Gets a Green Light

In the 1990s, Skandia was a leading insurance and financial services company in Scandinavia. However, it was deliberating about the fate of AFS, one of its less successful subsidiaries. Leif Edvinsson, who served as vice president of intellectual capital at Skandia, discussed the situation in an interview[1] he gave in 1997 at Skandia Headquarters:

Skandia AFS in 1990s

Skandia's top managers gathered in Stockholm in the early 1990s to determine the fate of AFS because the company was losing money. At the time, the managers decided to liquidate the company.

But Mr. Edvinsson had been gathering information that painted an altogether different picture from the gloomy financial reports the managers were referencing. In fact, his keen observations of the fledgling subsidiary in the months prior to the meeting had left him optimistic about its ability to succeed in the near future, in spite of its financial losses. Everything he was looking at indicated that something good was happening at AFS that the numbers didn't report—that AFS had what it took to be successful.

Mr. Edvinsson claimed that AFS was making a number of business decisions that would eventually improve its financials. They included:

- Recruiting talented employees.
- Working on developing a sound, long-term business strategy.
- Rapidly increasing its customer base.
- Improving its work processes.
- Implementing extensive information technology capabilities.

At the time, Mr. Edvinsson's analysis convinced Skandia's board that although AFS was temporarily losing in financial terms, it had all the building blocks of a solid company and was moving toward becoming profitable. These crucial building blocks, Mr. Edvinsson argued,

were worth further investment, *even at the expense of a temporarily less attractive balance sheet.* The building blocks he described consisted of the type of intellectual capital that enables future growth in spite of a temporary lack in financial capital.

After reviewing the intellectual capital that AFS possessed, the board was convinced to give AFS another chance. The decision proved wise: Within two years the company had indeed become profitable and growing.

Example: An Israeli Machinery Firm—A Company in the Green Gets a Red Light

Around the same time period, in a warmer part of the world, we found a similar story but in an opposite situation. It was described in a 1997 report from the Israeli state comptroller:[2]

The Israeli Machinery Firm

The comptroller's report described the results of auditing a particular government-owned company* specializing in machinery. Its financials were seemingly balanced, but further review showed that its managers had really just focused their cash on showing short-term profits and had invested almost nothing in research and development (R&D).

When the state comptroller reviewed the company's case, they realized that the company's products were outdated and the demand for them was on the decline. Although the financials were sound at the time of the review, without the forward thinking on R&D, the company's reports would soon tell a different story. The comptroller asked the company, "Without R&D, what are you going to sell in a year or two?"

*Not Rafael.

The state comptroller did not use the term *intellectual capital* while doing his review and probably did not even know about the term at that time. But he was able to predict that without renewing its knowledge—and fast—the machinery company would not be able to survive. While some might argue that a state comptroller always tends to predict gloomy results as a part of the job, he was actually right this time. Within a few years, the company in question found itself losing money in spite of receiving an

excess of government assistance and eventually was under consideration for liquidation.

In our terms, this company was losing its intellectual capital. Not putting money into R&D means losing structural capital and, eventually, losing human capital because various people within the company, including in R&D, will probably end up leaving.

Example: Tnuva—Apax Invests in IC in a Traditional Industry

More than 10 years later, we discovered another perspective on intellectual capital from a surprising source—Tnuva, an Israeli industry giant in the traditional sense. Established 85 years ago, Tnuva is a food company specializing in dairy products with sales of about $2 billion a year. With over 6,000 employees, Tnuva is a household brand name in Israel (especially for Tuvya, whose father worked for the company for 30 years). But because Tnuva's ownership system was out of date (owned by a cooperative of about 1,000 farmers which generally yielded low profits), it is not a company we would typically look to as an example of being innovative in knowledge management or rich with intellectual capital.

However, the purchase of Tnuva by Apax (an international private equity firm) in 2007 brought about major changes at the company with important implications regarding KM and IC. Zehavit Cohen,[3] the new chairperson of the board appointed by Apax, delivered interesting insights on Tnuva's case in a lecture at a leadership conference recently. Ms. Cohen described several aspects of the turnover in Tnuva following the acquisition, some of which we've included here:

> *. . . Apax does not buy firms for immediate results, like immediate sale for higher price or for ripping cash. We buy firms with high unrealized potential, for which our management team has an added value. So we can upgrade them for a profitable sale in five to seven years . . . .*
>
> *We were appointing better managers where necessary, but were striving to retain other key personnel . . . .*
>
> *Our first steps in the turnover of Tnuva included a thorough investigation of work processes, from the top management procedure to the last machine in the manufacturing line. We were working to improve them as fast and as better as possible . . . . This is the way to achieve quick gains . . . .*

You have probably noticed that all the insights Ms. Cohen presented have to do with realizing the intellectual capital at Tnuva upon acquisition.

The components she discussed included both the human and structural aspects of the organization. And if you are not yet convinced that Apax was deeply cognizant of Tnuva's rich intellectual capital and potential for the future, this last quote from Ms. Cohen's lecture may finally prove our point:

> *We started long-term projects for improvement, including investments in processes and equipment. When the economic environment in 2009 hampered some of our financial results, some managers suggested suspending or cancelling these investments. I answered that as we are not a public company, I do not worry about quarterly results in the stock market. We are here to stay for several years, and I need these investments to have better results then. And I am telling you [this] from the point of view of a career CFO.*

Again, she never used the term *intellectual capital*. However, it is obvious that she was outlining how Apax was involved extensively in recognizing IC in its acquisitions and raising its visibility to ensure a better future for its organizations.

A Quantitative Definition of Intellectual Capital

The three prior examples detail how businesses from a variety of industries all understand that financial results are not the only factor in determining the future success of an organization. They take into account other important factors, such as:

- The skill and expertise of a company's human resources.
- The extent and financing of its R&D investments.
- The efficiency of existing and potential work processes.
- A company's IT infrastructure and customer base.

Successful organizations invest in these things even though they are not as tangible as some tactical plans and projects.

The sum of these major factors, and so many more, is what we are calling intellectual capital. While these three examples were picked at random, they represent the fact that most businesses actually do make a point these days to pay attention to intellectual capital.

Professor Baruch Lev, from New York University Stern School of Business, has systematically researched the value of intellectual capital during his career. Professor Lev is the director of the Vincent C. Ross Institute of Accounting Research and the Philip Bardes professor of accounting and

finance at that university. The results of some of his research published in 2004 in the *Harvard Business Review*,[4] and of others he cites there, are very supportive of the actions described in the preceding cases. For example, Professor Lev states that, "In the 1990s, U.S. corporations invested about $1 trillion a year on intangibles, similar to what they spent on physical assets."

A trillion dollars is a lot of money, collectively (even though you may feel skeptical after hearing trillions of dollars was poured into the U.S. economy in the 1990s prior to the major economic crises in 2000 and then again in 2008). As a manager, or part of a team of managers in a company, you may try to use this impressive number to justify expenditures on intangible assets like IC that match what you spend on physical assets.

However, if you want to be rigorous, how do you find out if the investment in intangibles is worthwhile? Calculating the value is complicated, as we will explain later. However, Professor Lev gives an estimate of the return on investment (ROI) from investing in research and development (R&D), which is just one component of IC:

> *The annual ROI on R&D investment at that time was in the range of 25 to 30 percent. This is substantially above the returns on physical assets and, just as telling, above firms' cost of capital, even after accounting for the relatively high risk of R&D.*[5]

The research does not lie. And hopefully you are doing the same thing in your business, namely investing in intangibles in addition to physical assets. Even if you aren't entirely familiar with the term *intellectual capital*, you have definitely invested in some of its components throughout your experience, and you may have done it intuitively.

Next, we will help to further establish the value of intellectual capital to a business, and deliver a more systematic method to describe and manage it.

A (Very) Simplified Estimation

The value of intellectual capital, being intangible, is difficult to estimate. Even though the concept was introduced about 20 years ago, it has not yet been incorporated into the formal accounting methods of companies (at least until most recently, beginning in 2010). We nevertheless would like to present some methods you can use for estimating the value of intellectual capital. These methods will help you understand IC, its relation to its components, and its monetary value.

A very simplified estimation of the value of the IC of a company is based on the difference between its stock market value (MV) and its classical book value (BV):

Intellectual capital (IC) = Market value (MV) – Book value (BV)

The classic definitions of the book value of a company are based on financial indicators measuring tangible assets: money, real estate, machinery, equipment, and so forth. Generations of accountants have toiled over perfecting the definitions of these assets, yielding a financial reporting system that reflects the book value.

However, the BV does not take into account any intangible assets. Most of them, like training or process improvement, are not reported. Additionally, R&D investments, which are reported, are considered an expenditure that decreases the BV (even when someone who invests in R&D expects that eventually, in the long run, it will raise the BV!).

The stock market, however, should appreciate the contribution of the intangible assets of the company. The market value takes them into account as indicators of future continuous success, which is what the stock market cares about. For example, if the track record of a company over time shows that it uses its R&D wisely to produce continuous extra earnings, investors may pay higher MV for it.

As demonstrated in Figure 2.1, we see trends in the relations between IC, MV, and BV. For traditional, industrial-type companies, we see that their value consists mainly of tangible assets, and therefore their BV reflects most of the market value of the company according to the stock market. Note, however, that the best of these traditional companies do have some IC

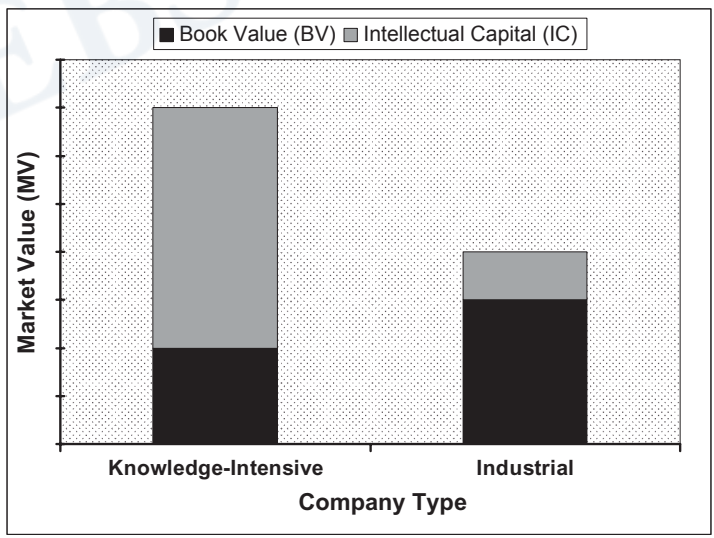

FIGURE 2.1 Market Value and Book Value for Various Company Types

even if it's not recognized as the modern definition of IC, as we saw in the three examples previously mentioned.

And for the more modern, knowledge-intensive companies, we see that the classic definitions of BV are insufficient, and their actual market value (MV) is often much higher than the BV. This gap was observed long before the bubble economy periods of inflated expectations. Annie Brooking,[6] a consultant and author, reported that in the United Kingdom this gap was about 50 percent in 1987; in the United States in the mid-1990s (again, before the bubble crises) it could be anywhere from four to eight times larger.[7]

Take, for example, a typical software company. In the early stages of its life, it does not have or need many tangible assets. Yet, if the stock market appreciates its potential in terms of the quality of its employees and its demonstrated capability to release successful products, it will have a high market value. The intangible assets of IC constitute a major part of its market value. In later stages, this IC should materialize in financial gains and a higher BV. But, to continue to be successful and yield higher earnings, such a company needs continual investment in IC, and those investments will always be a major percentage of its MV.

THE LIMITATIONS OF THE SIMPLIFIED ESTIMATION While this simplified estimation of IC is useful in helping to explain the concept, we need something more to help estimate its actual value.

The first problem in accurately demonstrating the value of IC is that most readers are now cynics, having lived through two major economic bubbles over the past 10 years, and are probably very suspicious of both MV and BV:

- Inflated MV became a major suspect after the popping of the first economic bubble, the high-tech bubble of the early 2000s. At the end of the 1990s, and until the crash in the early 2000s, many companies were traded at a market value that was excessively higher than their book value, sometimes tens and hundreds of times higher. These exaggerated ratios were the result of overly optimistic forecasts about the companies' potential future growth and earnings. The gap, which ultimately proved false, led many people to invest large amounts of money and then ultimately lose it.
- Book value got its bad publicity in the second economic bubble, the credit crisis of 2008–2009, when too many firms proved to have fraudulent financial reports.

Obviously, if you believe neither MV nor BV, no one will convince you to believe in IC.

The second problem is that even for mature companies, with an honest BV, it is difficult to have an accurate and proven record of MV for some

years. Market value is always fluctuating due to exogenous problems or various investor expectations, and it is generally difficult to use it as a basis for value estimation. In any case, the lessons of the bubble economies are discussed in more detail at the end of this chapter. The following section addresses the value of IC without using MV.

Baruch Lev's Method

Professor Baruch Lev overcomes both of these problems of simplified estimation by introducing a method using actual earnings independent of MV.[8] He looks at the annual earnings of a company, estimates what part of them is due to the customary yield on physical assets in that industry, and assumes the rest is the contribution of the intangible assets. The actual calculations are more complicated (please refer to Lev's original paper, if interested), but they eventually lead to an estimation of the IC of a company. There are some limitations, of course, that prevent Lev's method from becoming part of a formal accounting procedure, but it does give us the ability to quantitatively estimate the dollar value of IC.

A typical example of the IC of various major U.S. corporations according to Professor Lev is given in Figure 2.2.

Here are two immediate observations we can infer from the figure:

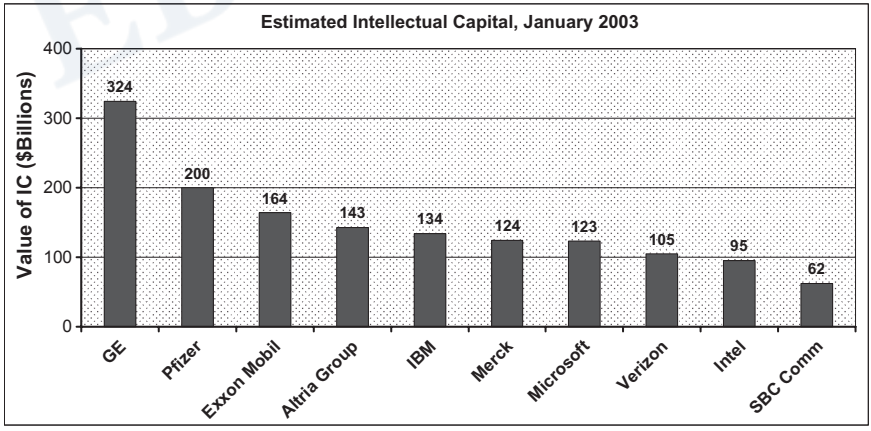

FIGURE 2.2 Example of the Value of Intellectual Capital for Various Corporations

Source: Adapted from data from Baruch Lev, "Sharpening the Intangibles Edge," *Harvard Business Review*, June 2004.[9]

1. The sums are enormous. The IC value amounts into the tens and hundreds of billions of dollars for these corporations.
2. While huge IC expenditures may not be surprising for high-tech giants like Microsoft and Intel, they are also very large for old industries like Exxon (oil) or Altria (cigarettes and food).

These examples highlight that in order for knowledge organizations (KOs) to compete, *they need to increase their intellectual capital.* In fact, that's what knowledge management is all about: increasing IC capabilities. Further, the *primary mission* of any manager is to ensure the organization's long-term prosperity by increasing IC. In order to raise intellectual capital, one needs a systematic method for managing it, as we present in the next section.

In any case, successful firms, especially companies in the high-tech sectors, but also in traditional industry, are having a huge renaissance in IC and investing a lot of money and manpower in regard to management's attention in order to achieve it. The amount of time and money being put toward IC currently is a quantitative proof in establishing the business case for IC and for knowledge management as a systematic way to increase it.

The Systematic Management of IC

If, as we argue, IC is the most basic asset of a knowledge-intensive company, then its enhancement and proper management become chief aspirations. Granted, most well-managed companies do control at least some of the components of IC: human resource practices, initiatives for improving work processes, R&D investment decisions, and so on. Your company is probably an example of one.

However, in light of the importance of IC, and its vulnerability to being overshadowed by short-term financial considerations, we need a comprehensive and systematic method to manage it. We need a common language, akin to the traditional accounting method, that allows us to visualize and measure the intellectual capital of the organization.

There are several known methods to achieve this goal. All of them use the organizational strategy of defining various indicators representing the various components of IC, and presenting them in some structured way. Many are based on variations of the Balanced Scorecard, described in books by Kaplan and Norton,[10] or the Navigator, a visual structure used by Leif Edvinsson[11] in Skandia of Sweden in the 1990s. We begin by dividing IC into two major components: human capital and structural capital (please see Figure 2.3).

Human capital has to do with the people of the organization: their knowledge, innovation capabilities, and skills. Increasing human capital is

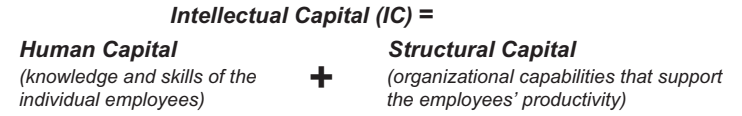

FIGURE 2.3 Human Capital and Structural Capital

about hiring the right workers and investing (and reinvesting) in their continual training and education. It is an extremely important aspect of a knowledge organization and the focus of numerous knowledge management techniques, as we discuss further in Chapter 5.

The major issue with human capital is that it is not the sole property of the company. It goes home after work and is free to leave the company at any time. Structural capital, by contrast, is an asset that is owned by the company. It is the sum of the organization's capabilities and core competencies. Examples of structural capital include work processes that enable the efficient design of software products, the experience gained in previous projects, investments in R&D, a company's customer base, and so on. We continue to discuss structural capital extensively in most of the following chapters.

The Skandia Navigator

We can present the various components of both human capital and structural capital using the Navigator. The process surrounding the Navigator, developed by Leif Edvinsson in the mid-1990s, is outlined in Figure 2.4.

The process consists of a house-like shape comprising the various components of the financial and intellectual capital of a company. Each component contains various indicators (usually company-specific and not stand-alone numbers) representing its characteristics. The indicators are usually compared to the data of previous years or to what the company has planned or budgeted.

Mr. Edvinsson uses the house as a metaphor for the organization, and its components represent the important building blocks of its capital.

PAST PERFORMANCE The roof, or attic, is the Financial Focus. Its indicators are usually the standard data in the conventional balance sheet—sales, expenditures, profits, cash flow, and so on. While it is the top result we want to achieve, it actually represents what we have done in the past.

PRESENT STATUS The main building is composed of indicators pointing to the present activities of the firm. The Human Focus is positioned in the center on purpose, in order to highlight its importance and connection to every other activity: It is the heart of an organization. Typical indicators

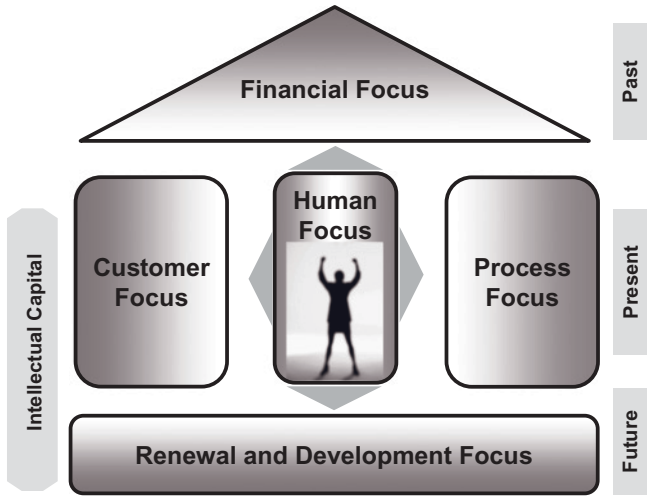

FIGURE 2.4 Skandia Navigator—General View

Source: Adapted from Leif Edvinsson[11] and Skandia annual reports 1996, 1997.

are number of employees, percentage with higher education, retention rate, and so on.

The two side walls are the Process Focus and the Customer Focus. Process Focus is a major part of structural capital and includes indicators representing the efficiency of work processes. It may include the cost and/or time required to manufacture typical products at the company, or indicators about reusing existing knowledge.

Customer Focus includes indicators representing customer base and customer relations, such as number of customers, market share, new or returning customers, results of satisfaction surveys, and so on.

FUTURE RESULTS The basis on which the metaphorical house stands is the Renewal and Development focus, which is directly related to the expected future results. Typical indicators may be the R&D expenditures of a company or its number of new products.

Note that only the first focus area, the financial focus, reflects the traditional book value of the firm. All the other focus areas compose the IC of the company.

Figure 2.5 represents the Navigator with some typical indicators.

A typical manager will concentrate on a small number of chosen indicators, perhaps 10 to 30 covering all focus areas. This may be handled by one spreadsheet. A corporate manager may also need only these indicators, but they will be the aggregate of the various departments. Skandia, which

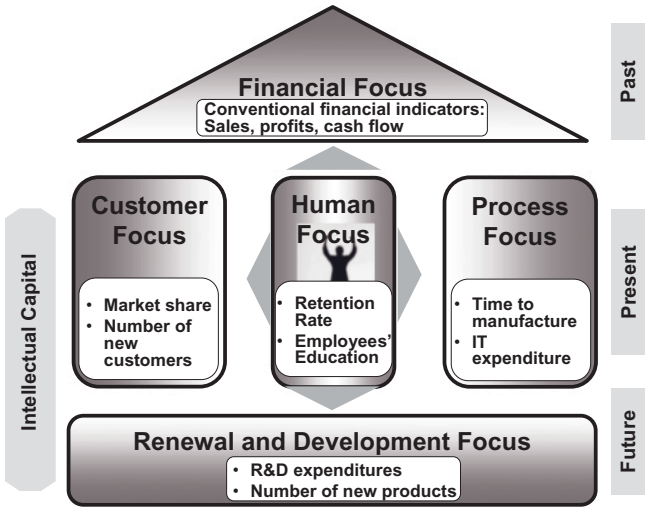

FIGURE 2.5 Skandia Navigator—View with Typical Indicators

Source: Adapted from data from Leif Edvinsson[12] and Skandia annual reports 1996, 1997.

used the Navigator for day-to-day management,[13] used an IT system to handle this process.

The main challenge is not the accounting of the indicators, but the strategic choice of actions in the IC exercise and deciding on the appropriate indicators to measure.

Managing IC Using the Navigator

Managers are the ones who navigate the company. The Navigator is just a tool to assist them. It forces a clear definition of their IC goals and enables them to visualize and measure them.

Take, for example, an investment decision that responsible managers face every year: how much, and where, to spend on R&D and other activities. Baruch Lev describes the outcome of such decisions in the following example:[14]

Example: DuPont's R&D Results

DuPont's textiles and interiors division has more $12 billion in annual sales, and obviously spends considerable resources on R&D. Professor

(continued)

Lev calculated the results of these investments over a period of 15 years from 1985 to 2000:

- *Product R&D,* aimed toward new or improved products, created a value of hundreds of millions of dollars but with ROI not much more than the cost of capital. This is what we usually associate with R&D focus.
- *Brand enhancement activities,* which we usually associate with customer focus, created half the value associated with new and improved products with less investment.
- *Process R&D,* enhancing the efficiency of chemical production processes, created savings worth twice the value of product R&D. These efforts are associated with both R&D and process focus.

Professor Lev's results not only reemphasize the business case for IC, but also demonstrate the possible contribution of its various elements. Not surprisingly, the indicators we gave in Figure 2.5 as examples may be used to track some of the relevant activities described in this DuPont story: R&D expenditures, number of new products, and cost/time to manufacture, among other things

The manager must decide about the direction of the IC process and allocate resources in advance. As we see in the DuPont example, these are major strategic issues. The Navigator cannot make these decisions, nor can Professor Lev's calculations, which are made after the fact. The manager makes these decisions according to the vision and strategy of the company using his experience and the available data and analysis at the time. (We discuss more of this process in Chapters 3 and 9.)

But while the Navigator does not make the strategic decisions, it contributes in many other ways. First, by forcing the manager to systematically evaluate the issues, it brings all areas into focus making managers look at long-term investments instead of short-term profits. Additionally, when the manager makes decisions, he can use the appropriate indicators in the Navigator to assign the proper goals and check their progress. Then, later on, the Navigator aligns the efforts of all the stakeholders in the organization toward the preplanned direction. (A detailed description of using the Navigator to measure and manage performance is given in Chapter 9.)

The Balanced Scorecard (BSC)

The Balanced Scorecard is another systematic method to manage IC.[15] Its goals are the same as the Navigator's: forcing the manager and the orga-

nization to take care of IC with all intangible components accounted for. It also arrives at a set of chosen indicators, presented in a structured way, and guides the organization in a desired direction.

The structure of BSC uses different terms, but has a purpose similar to that of the Navigator. It arranges indicators into four categories (called *perspectives* in some versions of the BSC):

- Financial.
- Customer.
- Internal processes.
- Innovation and learning.

Even though we are personally more accustomed to using the Navigator to manage IC (and we like its visualization and simplicity), the BSC does have some important advantages. First, as of the publication of this book, BSC is more popular, with many vendors offering books, training, and/or specialized software applications to specific types of organizations. Second, it has systematic ways to help managers come up with indicators derived from strategy.

However, the end results are similar to the Navigator's: The managers make decisions about IC and knowledge management strategy, and the BSC helps them manage it.

Questions for Believers and Nonbelievers

At this point, we hope that you are realizing the importance of IC and its management. We think that a concerted IC plan is essential to an organization's future success. This importance is reflected quantitatively in the research presented by Professor Lev, and others, in the amounts of time and money that businesses have already put into IC management.

However, we still expect readers to be wary of the intangible implications of investing money and efforts in IC. We round out this chapter with answers to some questions we think you might ask.

Question: In our company, we invest in R&D and take good care of our workers. Why should I bother with IC?

Answer: Well-managed organizations nurture their IC even without explicitly using that term (i.e., whether they realize it or not). Responsible managers pay attention not only to the bottom line financially but to all the parameters that determine the future health of the organization simultaneously. Well-informed

managers discuss and plan a firm's marketing and customer base, human resources, training, and work processes, as part of their regular duties.

However, focusing on the concept of IC ensures a more systematic and comprehensive implementation and participation of every stakeholder in the organization. When combined with a structured management tool, such as the Navigator, IC management highlights issues no manager can afford to neglect. Focusing on IC forces managers to discuss a vision and plan a strategy. It requires translating the strategy into action in all focus areas, which entails agreeing on relevant indicators and setting goals for them. Focusing on IC also ensures that managers do not forget the indicators during their day-to-day work.

Question: Can IC indicators be translated into a dollar value? If not, how can the indicators predict future success?

Answer: Unfortunately, there is no algorithm that directly translates IC indicators into a dollar value. Tuvya debated similar questions with Leif Edvinsson during his interview at Skandia.[16] Tuvya claimed that the move to publish the Navigator as a supplement to regular financial reporting could lead to the misconception that such an algorithm exists.

Mr. Edvinsson responded that, eventually, careful management of IC turns into dollar value, and that while each indicator by itself may not have a direct implication for long-term success, their combination enables the company to arrive at a better future. The secret is to work on strategy, identify the key success factors for the organization, tailor the indicators accordingly, and manage them.

Question: Could IC management have prevented the first bubble economy in the early 2000s?

Answer: Yes! The first economic bubble, the high-tech bubble, was characterized by many companies being traded at an exaggerated market value—tens and hundreds of times more than their book value. When analyzing these gaps using IC, we argue that investors could have distinguished between gaps in the BV and MV of the companies involved. Most of the companies that collapsed, in spite of promising innovation in technology and plenty of cash, were lacking important aspects of intellectual capital.

For example, many of them did not identify the need to focus on and thereby develop customer capital beyond the

present. For others, a comprehensive assessment of their actual R&D competencies or their work processes would probably have revealed they were not mature enough to generate return on the investment. And still others were overly concerned with their R&D processes alone. Perhaps a tool such as the Navigator would have helped them realize the potential held by their technological innovations by presenting them with a more balanced picture of the total assets (real and intangible) they needed to manage long-term.

But how do we distinguish believing in IC from false optimism? The true test of our claim that IC brings results lies in the development of the indicators that distinguish gaps between market value and book value. These indicators reveal whether the gap results from unrealistic expectations or from measurable competencies in a firm, such as its technology, processes, and customers. The indicators should identify which companies are experiencing bubbles and which have valuable IC cultures, nurtured and systematically managed by their managers.

Question: Could IC have prevented the second bubble economy in 2008–2009?

Answer: Unfortunately, no, IC could not have prevented the recent credit crisis. However, it might help us to get out of it.

Wherever and whenever you look at the recent bubble economy of the late 2000s, you find greed and fraud as the basic cause. Governments, banks, corporations, and the public were trying to get (much) more money from their investments than was warranted by the realistic prospects of return or the intellectual capital in those investments.

When market participants ignore the basic conservation laws of physics, nothing can help. But when we investigate how to get out of the crisis, with limited natural and capital resources available, then we naturally revert to recruiting all available knowledge in a system to create stronger management of intellectual capital.

Question: My organization does not exactly fit into either the Navigator or BSC systems in terms of management. How can I manage my company's IC?

Answer: The concept of IC is important and valid for almost every organization, be it a high-tech company or a more traditional one. Of course, the vision, goals, and strategy may differ from one company to another, in turn creating different indicators, but the

goal is the same: fostering a successful culture where IC moves the business forward.

Both the Navigator and BSC systems can be easily adapted to various types of organizations. For example, you can substitute certain financial results with the actual bottom line by which you are measured. Or you can substitute customer-based and/or process-based indicators with more relevant terms. But never forget about human resources indicators and a company's need for strong renewal and development plans. (We elaborate on these indicators in Chapter 9 when discussing performance.)

Most important is to adhere to the concept of taking IC into account and managing it properly. Look at all the aspects of the organization relating to IC and not only the bottom line; then decide your strategy, set your goals, and define the appropriate indicators in order to achieve them.

Conclusion

Nourishing intellectual capital and creating the knowledge culture necessary to increase the different aspects of IC are keys to the future success of organizations.

We believe that once managers internalize this message, they realize that knowledge management is about increasing IC and that increasing IC is the most important thing they can do to ensure an organization's long-term prosperity.

This chapter concludes the first and introductory phase of the KM journey, describing the motivation for using KM to increase IC. The rest of this book provides tools for systematically and comprehensively managing intellectual capital from all angles. The next chapter explains how to use KM to accomplish strategic goals, and the benefits of coupling the two.

The Magnificent 7

1. Managers who are traditionally preoccupied with short-term financial results should ensure long-term prosperity by increasing IC. The business case for paying attention to IC is supported by numerous examples of successful companies and quantitative research results.
2. Knowledge management is about identifying and systematically managing the IC of knowledge companies as their most important asset.

3. It is complicated to measure the value of IC. Some insights may be gained by defining intellectual capital quantitatively as the difference between the organization's book value and its market value, and qualitatively as the sum of the knowledge and skills of the individual employees and the organizational capabilities that support employee productivity.
4. More sophisticated methods for measuring IC, like Lev's, prove that successful firms, especially companies in the high-tech sectors, but also in traditional industry, are having a huge renaissance in IC. They invest a lot of money, manpower, and management's attention in order to achieve it.
5. Managing and increasing IC begins with business strategy, from which key success factors can be derived. For each key success factor, several indicators should be defined to manage and measure the performance. We can use one of the available methods, like Skandia Navigator or the Balanced Scorecard, for systematic management of these indicators in order to increase IC.
6. Careful use of IC indicators could have helped to prevent or alleviate some of the consequences of the two economic bubbles of the recent decade.
7. Successful use of the indicators to increase intellectual capital depends on an organizational culture that supports knowledge management and in which the indicators are known and understood. It is the manager's role to foster this culture.

CHAPTER 3

The Importance of Strategy in Knowledge Management

In this chapter you will:

- Learn about devising a knowledge management strategy that derives from and supports the overall business strategy.
- Learn that a shared organizational strategy (outlining the vision, core values, and core competencies to achieve it) is a prerequisite for solid knowledge management.
- Learn that a business strategy should link an organization's competencies with the needs of its environment.
- Understand how knowledge management serves the strategic management process, by drawing upon the knowledge of a company's workers, and leads to the attainment of strategic goals.

A well-planned knowledge management system serves the overall business strategy. It also addresses the fact that knowledge management (KM) requires a strategy of its own. Successful knowledge management does not occur through isolated interventions but through a systematic and comprehensive plan that outlines the specific competencies that a company intends to develop. Ultimately, a knowledge strategy should be tailored to the specific needs and characteristics of an organization.

The following example about Arkia details how a company's look at strategic management essentially became a plan for its knowledge management. At all levels, from strategic management to day-to-day problem solving, Arkia was managed with the aim of taking the most advantage of the knowledge available within the organization and putting it toward achieving strategic goals.

Arkia—A Knowledge-Based Strategic Transformation

In the early 1990s, the Israeli domestic airline Arkia operated in two basic areas: domestic flights and international charter flights. During a routine analysis of strengths, weaknesses, opportunities, and threats (SWOT), developers hired by Arkia presented to the managers ways that they could take advantage of additional competencies available inside their company that could increase their business. For example, in order to promote domestic flights to Eilat, Israel's southernmost city and a favorite vacation spot, Arkia began selling vacation packages that included hotel rooms, car rentals, and passes to its recreation sites.

Edna, who was a part of the panel advising Arkia at the time, presented to them a strategic process in which they could make money from knowledge: Multiply their channels and sell tourism products independent of the flights. Utilizing the knowledge it had at its disposal regarding marketing vacation packages, Arkia was able to open a successful chain of travel agencies alongside its successful airline business.

A few years later, Arkia went through this analysis process again and discovered that it could further its prospects by selling its competencies in airplane maintenance to other companies. Slowly, but surely, Arkia developed an organizational culture in which every worker began the day with the question, "What do we know how to do that we haven't sold yet?" In fact, the change in thinking that Edna and various developers had incited at Arkia eventually made it possible for Arkia to become Edna's competition—it began selling a variety of consulting services to domestic airlines in other countries on how best to utilize their knowledge for new business opportunities.

The knowledge management process that Arkia underwent was a natural extension of its strategic process. Today, Arkia has developed a wide range of services that protect it from the risks of a company operating in the volatile tourism industry in Israel. Without looking at the proprietary knowledge particular to the company and using it to open new streams of income, it might not have survived if it had relied on flights alone.

Developing a Business Strategy Based on Core Competencies

In a dynamic business environment a corporate identity cannot be defined solely in terms of a portfolio of products and services. The life of these

commodities is getting shorter and shorter. In electronics, for instance, the shelf life of new products is often just a few months. Hamel and Prahalad, in a breakthrough *Harvard Business Review* article in 1988, suggested that a better way to define the identity and competitive edge of a company is by defining its core competencies.[1] In practical terms this means asking: What does the organization need to know in order to be able to develop new products and services better, faster, and more cheaply than its competitors? For Edna this incited a big epiphany, and she immediately began implementing this new concept in her consulting. She started helping organizations identify their competitive core knowledge and direct them in using it to achieve strategic goals.

Core competencies are more sustainable than products and services, yet as the environment gets more and more turbulent they, too, need to be reinvented, and this is exactly what happened in our example at Arkia. Through a carefully designed evolution and reevaluation, the company was transformed from a core competence of selling domestic and international flights to its customers to becoming a tourism company with the ability to consistently offer new products and services to new customers with new needs and tastes.

Once the Arkia managers evaluated their business and the knowledge available to them, their core competencies shone through and could be further developed and exploited. An airline company needs many more competencies in order to become a tourism company. It needs to be able to take care of a tourist all the way from the initial exploration phase of looking for different vacation spots to getting there, where to stay, as well as what to eat, where to go, and what types of entertainment options are available. Once these competencies were well developed and they began to sell them to customers, they instantly created new opportunities to exploit. Any business can deliver a wider range of customized solutions to new customers developed from its core competencies. At Arkia, they recognized an opportunity in expanding into all aspects of tourism—both in and out of Israel—thus growing their market and income exponentially.

What Is at the Core of Strategic Management?

Strategic management is the process that allows organizations to renew. In their daily lives, people in organizations are busy accomplishing their tasks and worrying about the "how" questions:

- How to complete their duties.
- How to meet deadlines, budgets, and customer demands.
- How to satisfy their managers' requests.
- How to manage their teams properly.

And much less time and attention are paid to the "what" or "which" questions:

- What should they do?
- What tasks should receive highest priority?
- Which goals should be pursued and which should be abandoned?
- What are they doing today that isn't as important for the future?

When organizations do pause to ask these questions, though, they are essentially devising a strategic program.

The Goal: Staying Ahead of the Game

The goal of strategic management is to ensure that the organization does not fall asleep—to gauge what has changed in the external environment and devise an appropriate organizational response. The organization must decide how to adapt in order to take advantage of new opportunities and protect itself from new threats. In other words, the organization decides how it will renew itself.

In a world that is quickly changing, the pace of organizational renewal has to be at least as fast as the external pace of events. Accordingly, the strategic management process should also renew itself.

The Process: Managing Knowledge

Knowledge should be managed strategically. Once the core knowledge of an organization has been defined, a strategy for managing it needs to be designed, too. Therefore, the knowledge management strategy outlines a systematic and comprehensive plan for managing knowledge. Knowledge should not be managed ad hoc. Interventions, no matter how clever or sophisticated, are only successful as part of an overall vision of a knowledge-managing organization (or learning organization). Only when you have this vision can you outline its implications.

We have discovered that a good way to explain this relationship between the business strategy and the knowledge strategy is by using the analogy of a school curriculum:

Strategy Example: The School Curriculum Analogy

When developing a school curriculum, first it is necessary to decide what a student needs to know, and only then is it possible to develop

an appropriate curriculum. What a school graduate needs to know is a very strategic question. Is science more important than literature? Is math a core competency in a global world or are foreign languages more relevant?

Edna was once invited to speak to an audience of school district management personnel, teachers, and parents on the question of what competencies will be most needed in a future working environment. After researching this question for some weeks, she ended up with two competencies as the most competitive ones for the future: learning competence and English fluency. These led to a clear knowledge management strategy:

- Teach students how to learn.
- Even more importantly, make them love learning since they will have to continue learning nonstop in an ever-changing world that is moving faster and faster.
- Next, teach them English. It is the most global language of academia and business and will enable them to participate successfully in the new global economy.

The same type of process—from business strategy to knowledge management strategy—is needed in companies, too. First decide what the organization needs to know, and then move to designing how to develop that organizational knowledge.

The Failure of KM without Strategy

In the mid-1990s a large Israeli telecommunications company rushed to implement knowledge management methods without a strategic vision. It bought and installed expensive cutting-edge software, but the software remained unused.

Without strategy planning, there was no understanding of the relevance or meaning of the information technology to the customer. The managers did not design a clear answer to what the organization needed to know before rushing to buy knowledge management IT support. They did not research a good answer to the simple question, "What will a smarter organization look like?"

Smart organizations are learning organizations; they first decide what they need to know, and only then do they develop that knowledge.

How KM Serves the Overall Business Strategy

Traditionally, strategic management is about focusing your efforts. One of the biggest challenges in planning strategy is choosing the focus of resources and eliminating secondary options. Although the need for focus in strategic planning remains, there is also a new need: In an uncertain world characterized by frequent changes, organizations need to attune themselves to a wide band of opportunities and threats and maintain flexibility. They can do this by continuously learning and keeping their eyes open to the outside world. Managing knowledge in an organization is about fostering learning processes and being open to external radii.

As we said, product life cycles are getting shorter. Instead of considering the organization's strategy in terms of the ideal mix of products and services, the organization needs to identify the capabilities that provide a sustained competitive advantage. Organizations can learn from individuals in this matter.

When someone is planning her career, she asks herself, "What do I need to learn to ensure a sustained competitive advantage in the job market?" Just as individual careers are becoming more dynamic, with predictions of four to five career shifts for the average adult, organizations will have to forget, or unlearn, some of the competencies that created past profit and develop new competencies for future growth. If an organization is too focused, what will it do when its current sources of strength wear out? The secret of an organization's strategic success lies in becoming an open laboratory for the next generation of exciting ideas in addition to an ongoing production of products that, at least for the time being, are sources of profit.

This approach is a real revolution in strategic management and may imply that there is no common path in strategic planning in such an uncertain and dynamic environment. But one conclusion does emerge: Just as an individual who wants to succeed needs to continuously learn all his life in order to ensure that his knowledge does not become outdated, only learning organizations can ensure their future success. Strategic management is an integral part of a learning organization on both the tactical and strategic levels. Ultimately, the organization's strategy provides an answer to the question, "What should we learn?" And the answer should be as broad as possible.

FINDING VALUE FROM INTANGIBLES In his book *Value-Driven Intellectual Capital*, Patrick Sullivan claims that intellectual capital (IC) and KM are transformed into a tangible dollar amount in many different ways according to the nature of an organization's activities.[2] He details that when an organization's primary activities focus on creating knowledge and sharing technological breakthroughs, it can take advantage of its activities by translating them into new marketable products and selling patents. Providers of professional services, such as lawyers, accountants, and consultants, sell

their human capital directly. Other companies generate value through creating and improving processes that raise profits and sales, improve market share, reduce costs, and improve productivity. By dividing firms into four categories—differentiated products companies, commodity products companies, network services companies, and direct service companies—Sullivan enables each type of firm to identify the kind of value it can and should extract from its intellectual capital.

Successfully Using Employee Knowledge as a Strategic Input

Strategic planning used to be the exclusive task of the CEO, who ultimately was responsible for its outcome, and senior managers, whose responsibilities included long-term planning. Increasingly, however, all levels of an organization are involved in strategic planning. The dynamic organizational environment requires employees at all levels to concern themselves with strategic issues. Middle managers in particular should be trained to incorporate strategic thinking in all of their activities.

The Demand: Evaluating Strengths and Weaknesses

Strategic thinking implies sensitivity to external trends and the ability to detect weak signals of changes in the market, in consumer behavior, in customers' expectations, in competitors' behaviors, the implications of new technologies, and the demand for human resources. Strategic thinking requires developing the courage to look in the mirror and honestly assess your strengths and weaknesses. Strategic thinking also includes collecting information about competitors, maintaining intimate contact with customers—even when they are satisfied—in order to identify opportunities, and continually assessing strengths and weaknesses.

These tasks cannot be left only in the hands of those at the top of the organizational hierarchy. The more the people at all levels of the organization concern themselves with these issues, the higher are the chances for future success.

The Tool: Effective Communication

One of the tools to get people together to share their knowledge is known simply as a *knowledge café*. This is a format for meetings especially designed to promote knowledge creation and sharing. It is a method that involves many people at once in a conversation regarding a particular issue that the management chooses. It can be particularly beneficial when management is making a significant decision and is interested in broad input from various perspectives in the organization.

A description of the format of a knowledge café is given in Chapter 6 regarding encouraging interactions. Another example is also given later in this chapter in the section on IBM. Brainstorming meetings like the ones at IBM can improve the quality of a group's decisions by incorporating multiple perspectives. The extensive involvement of the people taking part in the meetings leads to a widespread commitment to a decision. It also is a relatively short process, lasting anywhere from a couple of hours to a half day, but has significant added value relative to cost.

EXAMPLE OF A KNOWLEDGE CAFÉ: LEARNING IN RETROSPECT AT ARKIA Recently, in a roundtable conversation on innovation management, Professor Izzy Borovich told the story of the knowledge café he conducted with Edna in Arkia when he became its CEO:[3]

> *When I came from the university to Arkia, I found a 40-year-old company that [did] more or less the same things, and then Edna and I reached a conclusion that we should do something in order not to let the company sleep. If you sleep, you do not innovate and if you do not innovate, you die. We decided that in order to find out what and how to innovate we should listen to the employees and we designed a Knowledge Café.*
>
> *Thanks to the ideas of the employees who know the company best (they are its real sensors), Arkia—an airline—became the biggest tourism company in Israel in that time. Arkia had flown to Eilat for years and used to sell rooms in the local hotels to its flight passengers. It had a contract with the Eilat hotels. In our Knowledge Café, one Arkia mechanic said, "Why should we not sell rooms in hotels in Eilat to those who do not fly with us there, but come in a car?" Somebody else said, "And if we sell rooms in Eilat, why should we not sell hotel rooms in Netanya (another resort town in Israel)?"*
>
> *At the end of the process, we had contracts with all the hotels in Israel and sold exponentially more tourism packages annually, bringing in more revenue than ever before.*

Example: IBM—Ongoing Strategic Renewal

IBM's success over the years relies on a unique strategic combination of technological innovation and innovation in business management.[4] The following paragraphs illustrate the strategy at IBM that makes it a role model. (Innovation is discussed further in Chapter 10, among other places.)

Technological Innovation

In order to achieve success, IBM has always run the largest R&D array in its field, putting the company at the head of the U.S. patent receivers list for the past 17 years in a row. In that context, it is worth mentioning that in 2009, IBM research labs in Israel received over 50 new patents in the United States and took first place in U.S. patents for Israeli companies. A necessary condition for the success of such R&D centers is proper management of its employees, the knowledge workers (KWs). (We discuss the challenges of managing KWs and the methods to respond to them in Chapter 5.)

Along with an annual investment of over $6 billion in R&D, IBM has participated in a methodical process of acquiring companies and technologies particularly in the area of software. Over the past decade, this process has allowed IBM to present the most extensive, complete, and advanced product array available.

Over the years, IBM figured out how to adapt to the changing needs of the markets and has transformed itself accordingly. This transformation, brought about by exploring other fields of development, created a sea change whereby the company's priorities were completed renewed.

Because of its extensive focus on R&D, IBM basically invented the use of personal computers as a business model, and later conceived the world's most familiar mobile computing brand, the Think Pad. In spite of being a pioneer in these products, several years ago IBM made a brave decision to leave the mobile computing and printing markets in order to focus on areas where it realized it could provide a true added value to its clients.

Business Management Innovation

IBM's business agenda and long-term vision have made it what it is today: a company that provides an extensive and complete array of services and solutions including software, hardware, and methodology, as well as providing a deep understanding and knowledge of the various fields to which it provides its services.

IBM innovation is also one of modern business models. In the early days of the Internet, IBM was active as an Internet service provider, constantly creating new paths. Today, IBM is laying the foundation of new data analysis applications such as business analysis and cloud computing.

With bandwidth on one side and a fast-growing technological rate on the other, IBM presents analytic computing as the next generation of its technological vision based on data analysis research that has generated new insights into improving its future business. These areas of activity, such as developing business intelligence and information analysis plans, provide clients with the capabilities to use their information more wisely

and to extract new business insights, allowing them to eventually increase profit and competitiveness in a flatter, more mechanized world.

In addition to technological innovations brought about by its R&D, IBM has always initiated internal innovation-accelerating processes such as global brainstorming. Innovation Jam is one such resource and is held periodically on the internal communication network of the company. In this event, tens of thousands of employees, customers, and business partners all get together to share new ideas, conduct debates, and realize new insights regarding future trends, new services, and more. (See Chapter 6 for many other methods of interactions for sharing and creating knowledge.)

And lastly, acquisition and merger strategies brought about by these brainstorming sessions, among other things, have led to IBM's acquiring of global companies that are also bringing innovative capabilities to the mother company in the form of new products and services. Most of these M&A deals serve to complement and complete services, solutions, and products already at home at IBM.

Example: Rafael—A Strategic Transformation

During 2001 Rafael Advanced Defense Systems Ltd. was officially transformed from a government unit into a commercial, government-owned firm. This was the culmination of years of debates and deliberations with both hope and concern from various stakeholders. The end results, however, were very impressive:

- Within a decade, Rafael turned from a heavily subsidized government unit into a highly profitable company in terms of defense industry standards.
- It attained an important positioning in the global market, while keeping its technological leadership focused in Israel.

Relative to this book, we see the lessons in this example at Rafael as relevant to the connection between strategy and KM. In 2009, statistics on Rafael's position appeared in a newspaper article.[5] The data demonstrated the progress Rafael had made in part because of its transformation in 2001:

- Sales doubled from 2004 to 2009: from $800 million to $1600 million.
- Profits grew from almost zero (about $1 million) a decade ago into about $112 million.
- Its workforce grew from 5,000 employees in 2006 to 6,000 employees in 2009. Younger, niche-oriented engineers, technicians, and programmers made up most of the new workforce.