

Chapter 1

Introduction to Information Technology Investment Decision-Making

Learning Objectives

After completing this chapter, you should be able to:

- Describe different types of IT investment decisions manager face.
- Briefly describe some of the methodologies that are used in IT investment decision-making.
- Explain why IT investment decision-making is important as a subject to study.
- Explain some of the limitations that should be considered when using IT investment methodologies.
- Explain the role of IT investment decision-making within organizational planning.

Prologue

Information technology (IT) investment decision-making impacts all industries but sometimes in different ways. For example, Karadag *et al.* (2009) explored the importance of IT investment decision-making methodology in lodging industry. The research found that evaluation activities for hotel IT investments have not been performed widely and consistently and that some types of hotels tend to use more financial and non-financial IT evaluation methods, since all investments are expected to show a positive return on investment. The research findings highlight the importance of the use of IT investment evaluation techniques and the

major differences in their use require a substantial need for understanding a wide variety of IT investment methodologies to satisfy decision-making needs. To provide useful decision-making in IT investments today requires a broad understanding of the varied tools IT investment methodologies.

Introduction

The *productivity paradox* refers to the absence of a positive relationship between spending on *information technology* or IT and its resulting contribution to productivity or profitability (Lucas, 1999). Robert Solow, the 1987 Noble Prize winning economist felt there was a singular absence of measured productivity from the use of computers when looking for it at the industry or economy level of analysis. Other researchers seeking to find a connection between capital investments in IT and productivity at the company or business firm level of analysis have been equally surprised to confirm the lack of a relationship between investment on IT and firm performance (Brynjolfsson, 1993; Landauer, 1995; Qing and Plant, 2001). However, several other researchers have found that there is a positive relationship between IT investments and firm productivity and performance (Bhatt, 2000; Dewan and Min, 1997; Stratopoulos and Dehning, 2000; Swierczek and Shrestha, 2003).

The inconsistency in the research results mentioned above can be viewed as symptomatic of IT investment decision-making. That is, there are no single, simple methodologies that will give a consistent, reliable and optimal solution to managers facing an IT investment decision. One type of investment methodology can suggest one alternative and another methodology a completely different alternative to an IT investment decision choice. To try to help in this very complex decision situation, this book explores a series of methodologies that can be used individually or in concert to help aid in IT investment decision-making. We will try to explain where these decision methods can be used, in most cases their mathematical computational procedures, their informational value, and their limitations.

In the next few sections of this chapter, we will briefly introduce some of the types of IT investment decisions managers face to provide an orientation to better understand the problems IT managers face. We follow that section with an overview of the various types of methodologies available to aid in making those decisions and a brief discussion of their limitations. We also add an explanation as to why this subject is important to learn. We then describe the relationship of IT investment decision-making within organization strategic, tactical and operational planning as a way to bridge the context of general management. Finally, we end this chapter with an overview of the book organization to provide a logical system of for learning this subject.

Types of IT Investment Decision-Making Problems

Just about everyone has had the sometimes-challenging decision situation of purchasing a *personal computer* (PC). Did you ever think about the criteria you used as criteria and measures in coming to a final selection? Let's start with this type of simple IT selection problem as a common beginning to view the complexity in the differing types of decision-making problems this book will examine.

Most people start a PC purchase selection decision with a cost factor as a primary selection criterion. This criterion is usually measured or scaled in dollars as listed in Table 1. Within the dollar range (or sometimes beyond it) there are many other factors as briefly listed in Table 1 that create the typical multi-criteria problem we face in PC selection. Note that some of the criteria are measured in dollars, some are ranked, and some are just noted as being present or not. While it may be easy to choose between computers based on an objective criteria measure, such as the size of its memory (i.e., larger is usually viewed as a better deal), how can a dollar be compared with the rank of a brand name? Yet, this is what thousands of people do every day when they purchase a PC.

A decision process that requires a sequence of decisions can further complicate the simple PC selection problem. Suppose a secondary feature, like a video card in Table 1 could be considered as add-ons to

Table 1. PC selection criteria and measures

Factors (Selection Criteria)	Measures	Scale Used in Measure
1. Cost	Dollars	Number of dollars
2. Primary features	RAM speed	Processing time in gaga bytes
	Memory	Processing time in gaga bytes
	Operating system	Ranking of brand name
	CD read/write drive	Present or not
	Word processing software	Ranking of brand name
	USB portal	Number of ports
	Wireless	Present or not
	PC quality	Rating by consumer groups
3. Secondary features	Video card	Present or not
	Microphone	Present or not

those PCs that do not have that feature. This type of sequence of decisions is depicted in Figure 1. This would mean that that the video card feature (cost, quality, etc.) would have to be considered before a final decision on a PC could be made. This creates what is called a sequential decision process where a series of decisions must be made in an ordered fashion to arrive at the primary PC selection decision. This sequence could have many levels of decisions, each with multiple and conflicting criteria.

Now, let's continue to complicate this PC selection decision situation by suggesting that the new PC is to operate with another of existing PC that the user owns. Now issues of compatibility of the hardware and software, as well as user required retraining on the new PC features have to be considered in the primary decision on which PC to purchase.

The PC problem above is very simple relative to what managers face when selecting IT for operating systems in business organizations. In addition to all the factors above, business firms have to be able to integrate their systems within their own firms network and with their external partners, like customers and suppliers via the Internet or other mainframe computer information systems inside and outside the firm.

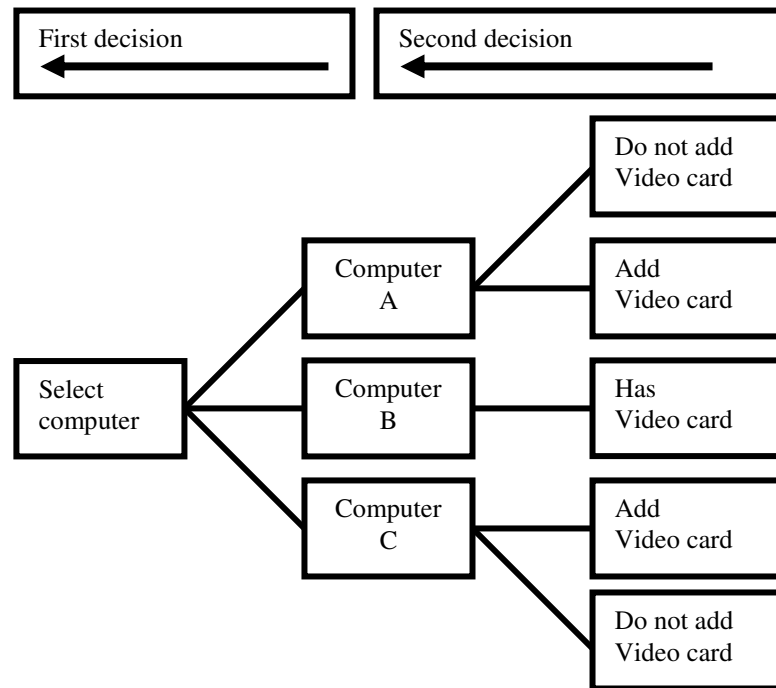


Figure 1. Sequential PC selection process

These factors could include those reported by Sarkis and Sundarraj (2002): intrafirm adaptability, interfirm adaptability, platform neutrality and interoperability, scalability (resizing capacity to meet changing needs), security, system reliability, ease of use, and customer support. One very challenging factor Sarkis and Sundarraj includes is that managers must seek to justify a decision by showing that the investment in IT returns some form of “perceived value” to the firm.

With all that complexity, how can a decision on IT be made? It will not be easy, but this book will focus on identifying and using the right methodology to deal with the decision-making situation. The basic types of IT investment decision-making problems this book is focused on answering includes the following:

1. What are the most appropriate quantitative methods and techniques for the evaluation of IT?
2. What quantitative and qualitative measures can be used in the assessment and evaluate IT investments?
3. How can we objectively render an IT decision when we use highly complex, multiple and conflicting criteria?
4. How do we choose the best alternative from a set of alternative IT projects?
5. How can we justify our IT decisions?

The methodologies presented in this book can be used in a variety of situations, including decisions on technology, systems, software, and human resource applications. The illustrative applications presented in later chapters will seek to demonstrate some of the many possible areas that the methodologies can aid in IT decision-making.

What are IT Investment and Decision-Making Methodologies?

There are different ways of defining *information technology investment* or *IT investment*. Keen (1995) views IT investment as a term that applies to investing in equipment, applications, services and basic technologies. Others, such as Weill and Olson (1989) view IT investment as the expenses associated with acquiring computers, communications, software, networks and personnel to manage and operate a management information system.

The definition that we will use for purposes of this book includes all of the components that make up *management information systems* (MIS). All MISs are a collection of four primary components: personnel, application software, system software, and hardware. As depicted in Figure 2, an MIS includes personnel who run and manage the information technology of the firm. The personnel might include users who must receive technology training (and therefore represent an IT investment), the technical personnel that perform the input/output

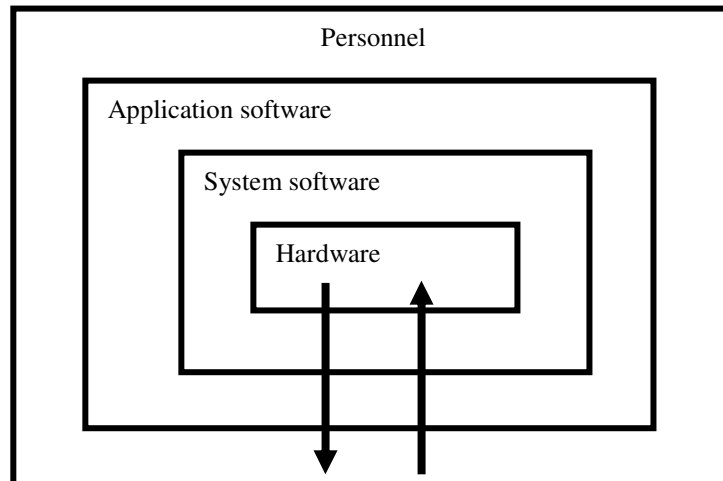


Figure 2. Management information system (MIS)

functions of the system and run the operating computer systems, and their managers. Other components include the *application software* (i.e., programming languages, C++, etc.), and *system software* (i.e., operating systems, interpreters, compilers, utility programs to manage data, etc.). At the heart of all these personnel and software is the driving, interactive component of the IT hardware (i.e., computers, data storage disks and systems, communication systems, network systems, etc).

The relationship of resources allocated to the individual components as well as the collective system that makes up an MIS is our primary focus. The definition of *IT investment* used in this book, can be defined as the investment decisions of allocating all types (i.e., human, monetary, physical) of resources to an MIS.

It is though the use of investment methodologies that we will be able to answer the questions this book posed in the last section. No book can possibly provide a comprehensive discussion of all the possible IT investment methodologies as there are differing opinions on what

methodologies are relevant in IT and which are not. For example, Sylla and Wen (2002) suggest that cost-benefit analysis, return on investment, return on management, and information economics are the primary methods for evaluating the “tangible benefits” (i.e., benefits like profit or cost minimization). They also recommend other methodologies for evaluating IT “intangible benefits” (i.e., benefits like customer satisfaction, improved employee motivation, etc.), such as multi-objective, multi-criteria methods, value analysis, critical success factors, methods for risk, real option, portfolio approach, and the Delphi method. Other studies on IT investment methodologies seek to just define a combination of quantitative and qualitative methods. For example Chan (2000) performed a comprehensive review of all IT investment literature in most of the top IT journals. Chan’s conclusion was that it takes both quantitative and qualitative methods to render a good decision on IT. Sarkis and Sundarraj (2000) suggested that more sophisticated requirements inherent in IT decision-making were being addressed by a variety of multiple criteria decision-making methodologies, which included the analytic hierarchy process, goal programming, and scoring models (all of which we will be presented in later chapters). The methodological topics selected and the depth of the treatment in this book will vary depending on the complexity and diversity of their potential application in IT investment decision-making. Some of the methodologies discussed in length in this book include those briefly described in Table 2.

Limitations of Methodologies

The methodologies and models that will be presented in later chapters are all based on the idea that we can identify and include all relevant IT decision-making factors. Unfortunately, the methodologies themselves limit what kinds of factors they can consider. For example, some investment models can use dollars as an input parameter, yet, as we have mentioned in the simple PC problem, it takes a combination of dollars of cost, a ranking of features, a possible scoring of quality, and so on, to render a more inclusive decision on IT investments.

In some situations, not being able to include the right combination of decisions factors or criteria can limit what is considered in the final investment decision. Also, the factors that are included may have been measured incorrectly or contain bias in some way. This leads to the old modeling problem of “garbage in, garbage out.”

Table 2. Select IT methodologies

Schedule	Capacity
Analytical hierarchy process	Calculate the overall score of decision-makers’ pair wise comparisons
Balanced scorecard	Evaluate investment from the users, business value, efficiency, and innovation/learning perspectives
Critical success factors	Obtain, compare and rank factors critical to business success and based on these rankings, deduce investment priorities
Decision theory	Calculate the expected value of investing in alternative investments
Accounting rate of return	Compare average after-tax profits with initial cost
Delphi method	Obtain consensus of experts’ opinion concerning the best alternative investment
Satisfaction and priority surveys	Survey and compare user and MIS professionals’ opinions on the effectiveness and importance of installed systems
Game theory	Calculate payoff of investment based on actions of the competition, mathematics and economic theory
Payback period	Calculate time required to recoup initial cost
Information economics	Calculate the overall value of an investment based on enhanced ROI, business domain, and technology domain criteria

Also, the time frame of comparing the costs of investing in IT and the eventual rewards or benefits of that investment do not always keep to a predicted time table. Usually IT investments involve upfront capital investment and the time period when the firm actually accrues the benefits of those investments may be very different, requiring a time adjustments component in the analysis. Also, financial-oriented methodologies tend to exclude most considerations of intangible benefits in preference to tangibles ones. Just measuring intangible benefits in such a way that they can be used in IT investment decision-making models is a very difficult task.

One of the primary areas that IT investment methodology is vulnerable is related to “risk”. Investments in IT are subject to higher risks than other capital investments. This increase in risk is due in part to the fact that technology components are comparatively fragile, easily sabotaged by employees, and usually decentralized (e.g., data storage in one state and CPU in another), which leads to increased difficulties in IT design, development, management, and protection. Generally, there are two classes of IT risk:

1. *Physical risks*: The vulnerability of computer hardware, software, and data to theft, sabotage; software vulnerability to piracy and deletion; data security laps.
2. *Managerial risks*: Failure to achieve anticipated benefits or cost reductions: implementation failure to achieve a desired time frame; end-user resistance; inability of system to support organization or its growth over time; and incompatibility issues that later develop.

Unfortunately these risks and limitations are to a greater or lesser degree inherent in all capital investment situations, including IT investment decision-making. Fortunately, selecting the best model or models can minimize the risks. This is one reason why IT investment and decision-making methodologies are important to study.

Why Study IT Investment and Decision-Making Methodologies?

There are many reasons why IT investment and decision-making methodologies should be studied, but they collectively can be expressed as a means of achieving a *competitive advantage* (Laudon and Laudon, 2010, pp. 92–114). Because management information systems are the core means of communication within firms and externally to customers and stakeholders, advancements in technology can quickly and efficiently give a competitive advantage of improved customer service. Their improvement can also allow a firm to more quickly seize business opportunities over their competitors. *Stakeholders* here not only includes stockholders or owners of a business, but also include the partnering companies that a firm counts on to help them perform their business functions. Examples of these partnering companies include transportation companies that ship and deliver a firm's goods. These partnering companies can also be consultants, subcontractors, drop-shippers, and all firms that support the operations and business functions of an organization. By improving the communication or ability to move data in a firm, you can multiply the efficiency and productivity of one firm over another, many fold. IT investments are the quintessential ingredient that can bring a quick and powerful improvement in communication and data movement, and thus bring a competitive advantage to a firm.

On the other hand, if a firm poorly invests in IT, that investment can become a competitive disadvantage needlessly increasing capital costs, increasing interest costs, delaying customer orders, disrupting communications within the firm and other stakeholders, and decreasing employee morale. These costs can be considerable. In a survey reported in *Computerworld* (1999), the time to implement an enterprise-wide IT system takes 23 months with an average cost of US \$10.3 million dollars. And these are only the up-front costs that a firm will incur if the system fails.

One purpose of this book is to help insure that IT investment decisions achieve a competitive advantage and help avoid any of the competitive disadvantage situations. Firms can only hope to realize their goals and objectives in IT investments if they carefully make their decisions on the best possible information. The IT investment

decision-making methodologies that are presented in this book are designed to provide additional information on which, at least, a better informed decision can be made.

Organizational Strategic Planning in IT Investment Decision-Making

It is important to know where IT investment and decision-making methodologies fit into the general planning framework of a firm. To understand their role, let's begin with basic MIS hierarchical planning stages as presented in Figure 3. There are three basic stages of planning in all organizations, and in all functional areas, such as the functional area of MIS (Irani and Love, 2002; Laudon and Laudon, 2010, pp. 102–109). At the *strategic planning* stage senior managers are expected to be involved in developing specific systems to implement corporation-wide strategy, and also develop the strategies themselves (Adler, 2000). This planning might involve deciding on expanding IT resources to support an expanded supply-chain distribution system for the corporation. It might involve the weighing of the risks of those expansions and the need to justify them within the context of corporation mission or purpose statements. The outcome of this stage of planning is usually a general set of goals and objectives, as well as some priorities and very general longer-term time-tables for their accomplishment. Firms often confirm compliance of these goals and objectives with corporate governance mandates (O'Donnell, 2003). For most organizations the corporation-wide goals (like growth in sales or growth in facilities) are also broken down into how the functional areas can support them. For example, a growth in sales for the corporation might be supported by the functional area of MIS by developing a new e-commerce division strategy for added e-commerce sales.

At the *tactical planning* stage it is expected that middle-level managers will implement the goals and objectives defined at the prior strategy stage. The planning now becomes a matter of how to implement the stated goals and objectives. While the strategic plan might have a five year schedule, the tactical plan would break this down into smaller time

periods, usually what must be done each year to accomplish the longer-term strategic goals. This planning also breaks the work down from one general set of strategic plans for all of the MIS functional areas, to individual MIS departments or divisions. In this way, the planning becomes more specific in time and units of effort to be performed. The tactical stage is chiefly focused on allocating resources to have the capacity achieve the desired work. An example would be determining the number of programmers needed each year for the next few years necessary to install a enterprise-wide computer network. Most importantly, it is at this stage of planning that the investment decisions on IT are made.

Finally, at the *operational planning* stage the more detailed, day-to-day work effort is planned and scheduled. An example here is a monthly, weekly or even daily schedule of work load of each employee, in each skill grade. Where tactical planning would consider total employees in a department, operational planning is much more detailed and focused on unique individual skill requirements to accomplish the more general tactical goals and objectives in scheduling work on a daily basis.

The MIS hierarchical planning stages in Figure 3 are fairly broad and general. Lets now narrow this planning effort down to more specific MIS steps or tasks to better see where the role of IT investment decision-making is positioned in organizational planning. These steps can be broken into the nine steps in Figure 4 (Michaud and Theonig, 2003; Wheelen and Hunger, 2003; Kangas, 2003).

Step 1. External analysis of competition and threats: In this step an analysis of the firm's external environment is undertaken in order to determine the major threats and opportunities facing the organization. This would include an analysis of the general environment, consisting of technological factors (e.g., speed of change in some IT is greater than expected, may outdate current investments), political factors (e.g., competition has newer computer systems and is viewed as more up to date than our firm), economic factors (e.g., competition is spending more on IT), physical factors (e.g., do we have the space or capacity to make IT changes equal to the competition), and social factors (e.g., does our

competition have better skilled people than we do). This analysis also includes risks that are posed by customers' expectations (e.g., customers expect our firm to be the most advanced in IT), suppliers (e.g., new ordering technology used by suppliers requires our firm to update to be competitive), competitors, and regulatory groups (e.g., changes in law mandate required investments in technology in order to comply with new regulations).

From this analysis we determine what opportunities we might have to beat our competition and areas where they pose a threat to our organization.

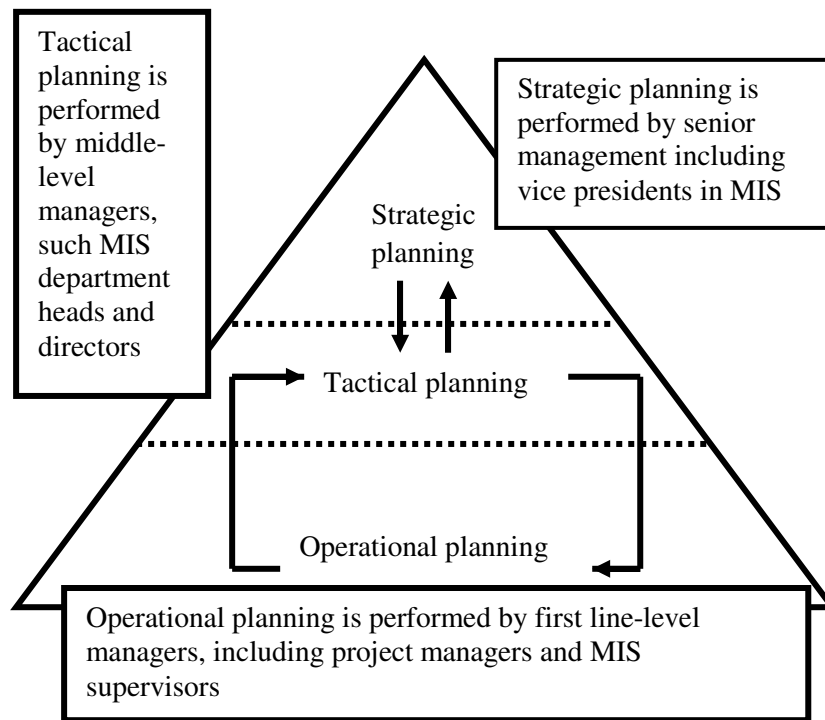


Figure 3. MIS hierarchical planning stages

Step 2. Internal analysis of the firm's strengths and weaknesses:

An analysis of the firm's internal resources is undertaken in order to determine the organization's major strengths and weaknesses. These strengths and weaknesses can stem from the firm's structure, culture, and functional area resources. A firm's strengths and weaknesses could revolve around factors such as:

1. Culture and how it promotes a high service level and employee loyalty.
2. Organizational structure and how it promotes flexibility and innovation.
3. Financial resources and how they give the firm the ability to obtain new equity and provide a steady cash flow.
4. Human resources and how they include quality managers as well as providing the firm with cost efficient labor, achieving a desirable absenteeism rate, and minimizing worker turnover.
5. Technical resources that promote high service levels and employee efficiency.
6. Physical resources that allow for flexible facility and equipment requirements and/or economies of scale.
7. Organizational resources that include an effective management information system, good coordination of functional departments throughout the organization, effective marketing, and/or a good public image.

Step 3. Overall corporate strategic planning: As previously stated, we seek here to achieve a corporation-wide policy that is consistent with the firm's corporation mission statement and general goals.

Step 4. MIS functional area strategic planning: We seek here to individualize the corporation-wide goals into the more narrow aspects related just to the functional area of MIS. This completes the strategic planning stage of the process and we move to the tactical steps next.

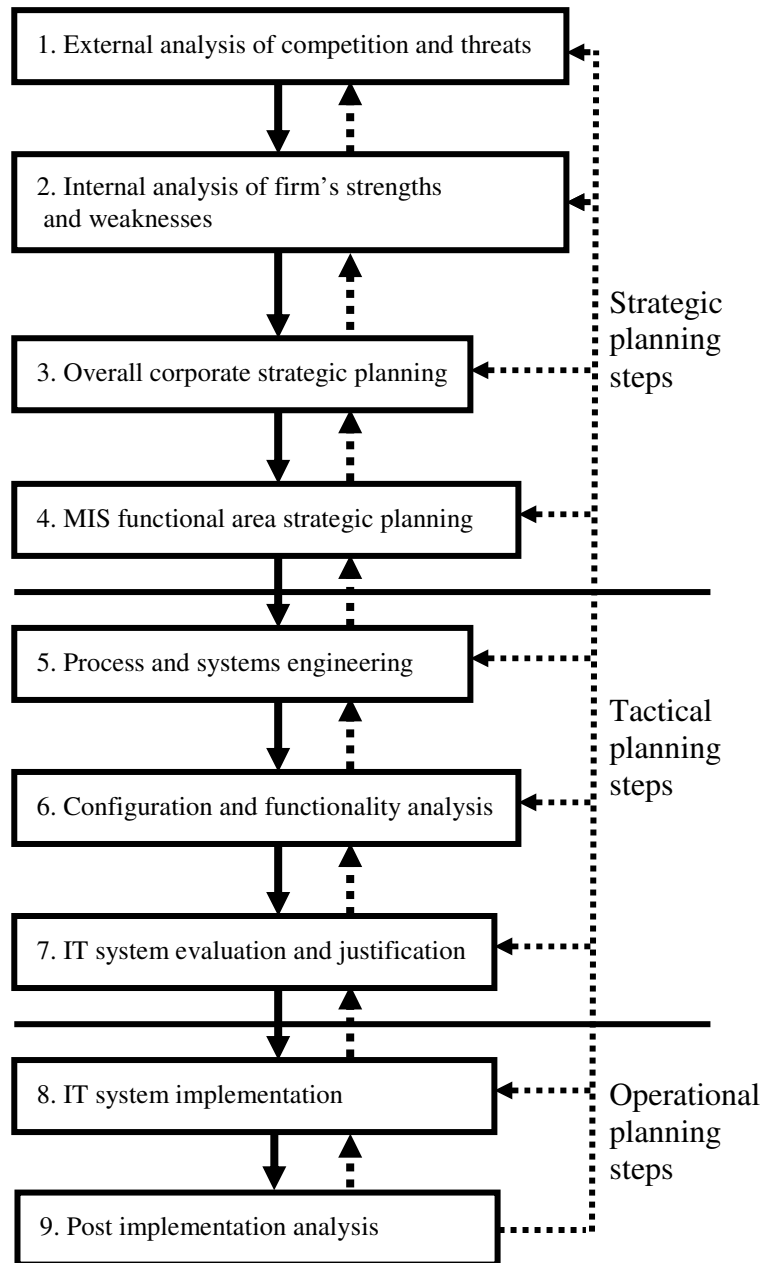


Figure 4. Detailed MIS hierarchical planning of IT systems

Step 5. Process and systems engineering: This analysis involves a thorough development and determination of the inputs, outputs and business processes of the firm's systems. This includes collecting cost and benefit information. The idea is to provide a base-line in which to measure the future impacts of change brought about by changes we may make in IT. This step might involve the process of business process reengineering, where we look at current policies, practices and procedures in delivering products to all customers (external customers and internal users), and see if a revision in those policies, practices, and procedures might lead to an improvement in service or productivity.

Step 6. Configuration and functionality analysis: This analysis depends on what is being considered in the change process. Usually it involves exploring alternative IT configurations (e.g., alternative network configurations). These configurations are examined in terms of how well they function to serve areas of business operations, such as marketing, sales, manufacturing, finance, accounting, maintenance, engineering, and human resources. In this tactical step of the analysis, a variety of quantitative and qualitative IT investment methodologies can be utilized. For example, multi-criteria methodologies like the *analytic hierarchy process* (AHP) can be used to rank differing configurations with relation to their ability to provide enhanced customer service. Thus AHP can help in the selection of the most ideal choice of configurations that will provide the best functionality and best customer service.

Step 7. IT evaluation and justification: Clearly this step is where all the IT investment methodologies are brought to bear on selecting and evaluating the best IT alternatives. This might include system-wide choices that are not accomplished in Step 6, or it might include very detailed individual component choices that make up a system. In this step we may find the sequential-type of decision-making problems complicating the decision process and multi-criteria compounding decision issues. Once the IT evaluation and justification is completed, we move to operationalize the decision in the next steps involving operational planning.

Step 8. System implementation: System implementation can be divided into four steps: acquisition and procurement, operational planning, implementation and installation, and finally integration. This is a very difficult step and often requires overcoming many difficulties because of differences in subsystems, platforms and interfaces. There are several strategies that can be used to accomplish this step and should be considered in the IT investment analysis as presented in Table 3.

Step 9. Post implementation analysis: This is a critical step that closes the loop of the IT planning process. While all the steps with the dashed lines indicate that feedback is possible to make revisions from

Table 3. System implementation strategies

Implementation Strategies	Description	When Used
1. Direct conversion	An existing system is removed totally and a new system installed	If there is only capacity or space allowed for one system to operate at a time or that the existing system is too costly, or dysfunctional to ongoing operations
2. Parallel conversion	An existing system and new system operate simultaneously until the new system is fully functional and the existing system can be discontinued	If the cost of shutting down the existing system is prohibitive
3. Phased conversion	New system is phased in as modules are systematically brought online	If the architecture of existing system will permit the gradual updating of new modules or the costs of a completely new system are beyond the resources of the firm
4. Pilot conversion	New system is fully implemented on a pilot basis in one part of the business operation	If the system has features that need to be examined in use, or the risk of converting entire system is too risky or expensive

the prior step, if necessary, this ninth step is a final form to check against the goals and objectives set at all the strategic, tactical and operational planning stages. It is a final check to make sure that the cost and benefits observed in Steps 6 and 7 and expected in the new system benefits are achieved in the end that was developed over all nine steps in this MIS planning process.

In summary, the use of the IT investment decision methodologies can support and aid in several steps in the overall MIS planning process, most notably, Steps 6, 7 and 9.

How This Book is Organized to Help You Learn

Structurally, the remaining chapters in this book have educational pedagogy designed to aid the reader in understanding the text material each chapter seeks to present. In addition to the basic subject content, each chapter includes the following sections:

1. *Prologue*: This small section provides an introductory example of current research or application of the IT investment methodologies mentioned in the chapter.
2. *Learning Objectives*: Readers should use these declarative sentences as a statement of what they can expect to find in the chapter and as a review tool after they have read the chapter to ensure they have attained the basic knowledge objectives of that chapter.
3. *Introduction*: Readers will find a helpful overview of the organization of the content of the chapter.
4. *Summary*: At the end of each chapter a brief summary of the chapter is presented in the first paragraph to remind readers of major points and on occasion discussion limitations of topics.
5. *Review Terms*: Throughout the book when new terms are introduced they are italicized and are restated here to remind readers of their importance. This listing also serves as a quick guide to abbreviations.

6. *Discussion Questions*: A set of discussion questions are presented as a means to stimulate ideas on content and further thinking.
7. *Concept Questions*: These questions can be used as assignments or a self-testing check to see if readers have learned the basic topics of the chapter.
8. *References*: All the references used for materials throughout the chapters are listed here. Readers can use these reference citations to locate the publication and further their knowledge of specific content mentioned or referenced in the chapter.
9. *Problems*: In some chapters where methodology is quantitatively presented, a set of problems are presented for assignment purposes and also to help readers understand computational aspects of the methodologies, while expanding their understanding of how they can be applied in IT investment decision-making situations.

This book's chapters are organized into five parts. Part I, "Introduction to Information Technology Investment Decision-Making Methodology," consists of three chapters. In Part I, Chapter 1, "Introduction to IT Investment Decision-Making Methodology," a basic overview was presented of what this book is focused on and how it is related to the planning of management information systems. Creating a beginning foundation for what IT investment decision-making methodology involves, this first chapter's content is further refined in the following chapters. In Part I, Chapter 2, "Needs Analysis and Alternatives IT Investment Strategies," an examination of justifying IT investments is presented. This chapter identifies the need to explore alternatives IT investment strategies as a means to justify the IT investment plans necessary to run state of art IT-based firms. Issues such as outsourcing IT needs and other alternatives are explored. In Part I, Chapter 3, "Measuring IT Performance" the issues and problems of IT measurement are presented. These issues include the economics, business performance, efficiency and effectiveness measures and each are examined to help establish a basis of consideration in the evaluation of IT investments.

In Part II, “Financial Information Technology Investment Methods,” three chapters seek to present a variety of financial investment methodologies to aid in IT investment decisions. In Chapter 4, “Basic Financial Methods” classic financial-related methodologies such as breakeven analysis, payback period, and accounting rate of return methodologies are described and illustrated. In Chapter 5, “Other Financial Methodologies,” a variety of differing classic financial methods are presented, including present value analysis, return on investment methodology, internal rate of return, and cost/revenue analysis. In Chapter 6, “Cost/Benefit Analysis,” is presented.

In Part III, “Multi-Criteria Information Technology Decision-Making Methods,” a variety of non-financial management science methodologies are presented in three chapters. These methodologies include: Chapter 7, “Critical Success Factors, Delphi Method and the Balanced Scorecard Method”, Chapter 8, “Multi-Factor Scoring Methods and Analytic Hierarchy Process”, and Chapter 9, “Decision Analysis and Multi-Objective Programming Methods.” These chapters’ contents are based on the most recent research on IT investment decision-making in their respective areas.

In Part IV, “Other Information Technology Investment Methods,” we finish our presentation with three additional chapters describing a variety of combined financial and non-financial methodologies that are commonly used in IT investment decision-making. These methodologies include: Chapter 10, “Benchmarking Techniques and Game Theory”, Chapter 11, “Investment Portfolio Methodologies”, and in Chapter 12, “Value Analysis and Satisfaction/Priority Survey Methods.”

In Part V, “Implementing IT Decision-Making,” two chapters are presented exploring the necessary implementation steps to insure that the applications of the decision-making models accomplish their objectives. These chapters include: Chapter 13, “Research Suggestions on Implementing IT Investment Methodology”, and Chapter 14, “Implementing the Outsource and Insource Decision.” These chapters’ contents are based on the wide-range of research findings on IT investment decision-making.

We end our book with an Epilogue chapter, “The Costs of Not Making the Right IT Investment Decision,” as a way of reminding

readers that there are consequences of not exercising good judgment and good methodology in making IT investment decisions.

Summary

In this introductory chapter we have introduced a definition for IT investment decision-making and explained its relationship in the MIS planning process. We have tried to explain the importance of this subject and briefly discussed its limitations in helping to aid in IT decisions. We have described where in the multiple stages of MIS planning that the application of IT investment methodologies are applied and fits into the overall planning of an organization.

One of the main points this chapter makes is that IT investment decision-making is a difficult task. While a handful of methodologies are briefly mentioned in this chapter, they are but a small number that exist to support IT investment analysis and decision-making. Some organizations actually avoid having to make IT investment decisions altogether by exploring alternatives to IT investment. This type of avoidance behavior can occur as a result of what is called “needs analysis” and is the subject of the next chapter.

Review Terms

Analytic hierarchy process (AHP)	Personal computer (PC)
Application software	Phased conversion
Competitive advantage	Physical risks
Direct conversion	Productivity paradox
Information technology (IT)	Sequential decision process
Information technology investment	Stakeholders
Management information systems (MIS)	Strategic planning
Managerial risks	System software
Operational planning	Tactical planning
Parallel conversion	Pilot conversion

Discussion Questions

1. Why is the “productivity paradox” important in IT investment decision-making?
2. Why is there such diversity in the types of IT investment decision-making problems?
3. What is the relationship between the components of an MIS and the use of IT investment decision-making methodologies? That is, give examples of the MIS components that might require an investment.
4. Why is it important to consider the limitations of IT investment decision-making methodologies in an analysis?
5. Why is it important to see where IT investment decision-making fits into the overall planning of business organizations?

Concept Questions

1. How does “sequential decisions” add complexity to a particular decision situation?
2. What are four types of IT investment problems? Explain each.
3. How would you describe three IT investment decision-making methodologies?
4. What are the four components that make up an MIS? Are decisions on IT supported in all four areas?
5. What are the three stages of MIS hierarchical planning? How are they further broken down into nine different steps? Where does IT investment decision-making fit in to the hierarchical plan?

References

- Adler, R.W., “Strategic Investment Decision Appraisal Techniques: The Old and New,” *Business Horizons*, November–December, 2000, pp. 15–22.
- Bhatt, G.B., “Exploring the Relationship Between Information Technology, Infrastructure and Business Process Re-engineering,” *Business Process Management Journal*, Vol. 6, No. 2, 2000, pp. 139–163.

- Brynjolfsson, E., "The Productivity Paradox of Information Technology: Review and Assessment," *Communications of the ACM*, Vol. 36, No. 12, pp. 67–77.
- Chan, Y.E., "IT Value: The Great Divide Between Qualitative and Quantitative and Individual and Organizational Measures," *Journal of Management Information Systems*, Vol. 16, No. 4, 2000, pp. 225–261.
- Computerworld, "ERP Averages" *Computerworld*, April 5, 1999, p. 6.
- Dewan, S. and Min, C., "The Substitution of IT for Other Factors of Production: A Firm Level Analysis," *Management Science*, Vol. 43, No. 12, 1997, pp. 1660–1675.
- Hill, C.W., and Jones, G.R., *Strategic Management: An Integrated Approach*. Boston, MA: Houghton Mifflin, 1992.
- Irani, Z. and Love, P.E.D., "Developing a Frame of Reference for Ex-ante IT/IS Investment Evaluation," *European Journal of Information Systems*, Vol. 11, 2002, pp. 74–82.
- Kangas, K., *Business Strategies for Information Technology Management*, Hershey, PA: Idea Group Publishing, 2003.
- Karadag, E., Cobanoglu, C. and Dickinson, C., "The Characteristics of IT Investment Decisions and Methods Used in the US Lodging Industry," *International Journal of Contemporary Hospitality Management*, Vol. 21, No. 1, 2009, pp. 52–68.
- Keen, P.G.W., *Every Manager's Guide To Information Technology: A Glossary of Key Terms and Concepts for Today's Leader*, 2nd ed., Boston, MA: Harvard Business School Press, 1995.
- Landauer, T.K., *The Trouble with Computers*. Cambridge, MA: MIT Press, 1995.
- Laudon, K.C. and Laudon, J.P., *Management Information Systems: Managing the Digital Firm*, 11th ed., Upper Saddle River, NJ: Prentice Hall, 2010.
- Lucas, H.C., *Information Technology and the Productivity Paradox*, Oxford, UK: Oxford University Press, 1999.
- Michaud, C. and Theonig, J.C., *Making Strategy and Organization Compatible*, New York, NY: Palgrave/Macmillan, 2003.
- O'Donnell, A., "Lean & Mean," *Insurance & Technology*, Vol. 28, No. 7, 2003, p. 27.

- Qing, H. and Plant, R., "An Empirical Study of the Casual Relationship Between IT Investment and Firm Performance," *Information Resources Management Journal*, Vol. 14, No. 3, 2001, pp. 15–26.
- Sarkis, J. and Sundarraj, R.P., "Factors for Strategic Evaluation of Enterprise IT," *International Journal of Physical Distribution and Logistics Management*, Vol. 30, Nos. 3/4, 2000, pp. 196–220.
- Stratopoulos, T. and Dehning, B., "Does Successful Investment in IT Solve the Productivity Paradox?" *Information and Management*, Vol. 38, No. 2, 2000, pp. 103–117.
- Swierczek, F.W. and Shrestha, P.K., "Information Technology and Productivity: A Comparison of Japanese and Asia-Pacific Banks," *Journal of High Technology Management Research*, Vol. 14 No. 2, 2003, pp. 269–289.
- Sylla, C. and Wen, H.J., "A Conceptual Framework for Evaluation of IT Investments," *International Journal of Technology Management*, Vol. 24, Nos. 2/3, 2002, pp. 236–261.
- Weill, P. and Olson, M.H., "Managing Investment in Information Technology: Mini Case Examples and Implications," *MIS Quarterly*, Vol. 13, No. 1, 1989, pp. 3–17.
- Wheelen, T. and Hunger, D., *Strategic Management and Business Policy*, Upper Saddle River, NJ: Prentice-Hall, 2003.