Processing Innovation 3

Every organization invests in innovation in order to change. Organizations put aside a proportion of turnover to change products, processes, and services. Particular objectives must be achieved because of this investment. However, a very large percentage of innovation activities fail to meet these objectives. The reasons behind failure give us clues about how avoid such failure in the future. In this chapter we examine the process by which organizations apply innovation. By understanding the process by which innovation takes place and then improving and mastering that process, organizations can lower innovation failure rates and speed up the process of growth. We also look at the process of innovation from idea generation, through evaluation, and on to realization, where customers become the ultimate judge of the success of an innovation. We conclude by looking at the innovation funnel that brings together four of the key ways to improve the ability of any organization to manage its innovation process: goals, actions, teams, and results.

LEARNING TARGETS

When you have completed this chapter you will be able to

- Show the main reasons why organizations invest in innovation
- Understand some of the reasons why innovation fails
- Discuss the key stages in the innovation process
- Understand the importance of opportunity recognition in the innovation process
- Explain the innovation funnel
- Apply an innovation method to building an innovation plan

Innovation Investment

Each year organizations spend a significant amount of turnover on innovation. The amount of investment can vary from as little as 0.5% of turnover for organizations that operate in stable marketplaces to more than 20% of turnover for organizations in emerging or turbulent marketplaces. The level of expenditure depends on the aspirations and ambitions of the individual organization and whether it has growth potential. The average expenditure across organizations is just under 4% of annual turnover (European Commission, 1996). For an organization with a turnover of $1 billion, this represents an annual investment of approximately $40 million. This budget typically is spread across various functions, including product design, information systems, manufacturing systems, and quality assurance, to allow innovative actions to be undertaken. As the innovation budget is often based on a percentage of forecasted turnover, three potential outcomes are possible. First, forecasts are correct, and thus the allocated budget is also correct, allowing planned innovation to be undertaken; second, the actual turnover exceeds the forecast, resulting in a budget that allows a greater number of innovative initiatives to be undertaken; and third, the actual turnover is less than that forecasted, resulting in insufficient budget to undertake the planned innovative projects. The latter scenario can result in an organization merging together, postponing, or even abandoning innovative projects because of the increased financial constraints. One disadvantage of this mode of innovation investment is that when an organization's turnover is decreasing, this is perhaps the time when the investment percentage should be increased. Innovation investment can be linked to more strategic rather than operational results. The topic of investment in innovation is discussed in further detail in Chapter 10.

Goals of Innovation

The principal goals required by an organization in return for this investment vary between organizations. The following have been found across a large number of manufacturing and service organizations and ranked in order of popularity, with the first goal being common to most organizations (European Commission, 1996):

1. Improved quality

2. Creation of new markets

3. Extension of the product range

4. Reduced labor costs

5. Improved production processes

6. Reduced materials

7. Reduced environmental damage

8. Replacement of products or services

9. Reduced energy consumption

10. Conformance to regulations

The first goal suggests that the most common reason for organizations to invest in changes to products, processes, and services is to improve quality. Most of these goals range across improvements to products, processes, and services and dispel a popular myth that innovation deals mainly with new product development. Most of the goals could apply to any organization, be it a manufacturing facility, marketing firm, hospital, or local government.

Failure of Innovation

Reaching particular goals is the ultimate objective of the innovation process. Unfortunately, most innovation fails to meet organizational goals. Failure rates vary widely depending on the type of innovation being undertaken, the experience level of those undertaking the action, and the particular context in which it is being implemented. Research cites failure rates of 50% relating to achievement of planned goals (Strebel, 1999), with other research claiming failure rates of up to 70% for new technology projects and 80% for new process initiatives (Burnes, 1996). From another perspective, a survey about product innovation highlights the fact that out of 3,000 ideas, only one will become a success in the marketplace (Stevens & Burley, 2003). As a consequence of the turbulent nature of innovation, a certain level of failure is an inevitable part of the innovation process and directly related to the level of risk the company is comfortable exposing itself to. All organizations experience failure, but the successful ones choose to monitor or understand why it has occurred and identify what can be done in the future to prevent it. The impact of failure goes beyond the simple loss of investment. The cost of failure can also include loss of morale among employees, increased cynicism, higher resistance to innovation in the future, and loss of lead time over competitors.

Innovations that fail are often potentially good ideas but have not been properly exploited by organizations because of budgetary constraints, lack of skills, poor management, or poor fit with the organization's current goals or market requirements. Failures will never be totally eradicated

from the innovation process; rather, they should be identified and screened out as early as possible. Organizations that try to avoid failure completely will inhibit the level of creativity of employees and skew their portfolio of innovations toward incremental changes. Early screening prevents unsuitable ideas from devouring scarce resources that are needed to advance more beneficial ones. Organizations can learn more about failure when it is openly discussed and debated. Lessons learned from failure often reside longer in the organizational consciousness than lessons learned from success. Although learning is important, high failure rates throughout the innovation process are wasteful and should be monitored to avoid mistakes being repeated.

The causes of failure can vary widely depending on the individual innovation. Some causes will be external to the organization and outside its influence of control. Others will be internal and ultimately within the control of the organization. Some of the more common causes of failure in organizations can be distilled into the following five types (O'Sullivan, 2002):

- Poor goal definition
- Poor alignment of actions to goals
- Poor participation in teams
- Poor monitoring of results
- Poor communication and sense of community

Poor goal definition means that organizations find it difficult to define their goals. Poor goal definition requires that organizations decide on appropriate goals for their environment and define these goals in terms that are understandable to everyone involved in the innovation process. Poor alignment of actions to goals means that organizations find it difficult to continuously link the ideas and projects they are pursuing with their goals. This is perhaps even more acute if goals are difficult to define in the first place. It also influences effective management of the portfolios of projects that the organization is undertaking to ensure they are balanced appropriately. Poor participation in teams refers to the behavior of individuals and teams, latent knowledge of the organization, and the particular skills of individuals to contribute to the achievement of innovation. It also refers to the payment and reward systems that link individuals to goals. The poor monitoring of results refers to sharing of the status of goals, actions, and teams involved in the innovation process within the innovation team and its main stakeholders. Finally, poor communication and sense of community relate to ineffective channels of communication and collaboration that constrain knowledge sharing and the ability of employees to participate as a broader community in the innovation process and make informed decisions when needed.

Process of Innovation

The ability to manage the innovation process is an essential competence of any organization, but members must first understand the workings of the process to be successful. The path innovative concepts follow from their initial generation as ideas through to their eventual consumption by the intended market can vary greatly (Tidd et al., 2005). In this and subsequent sections we will present two complementary ways to understand the innovation process. In this section we present the process as comprising four interacting processes, from idea generation through to eventual realization. This is a broad definition of the innovation process. Later we will present the innovation process as comprising five key knowledge areas that can be easily translated into a knowledge management system for innovation. This latter definition is based on the innovation funnel and focuses strictly on the aspects of innovation that can be codified into a set of simple innovation tools.

The process of innovation can be described in terms of the interactions between four key subprocesses (Figure 3.1):

- Idea generation
- Opportunity recognition
- Development
- Realization

Two related subprocesses are associated with opportunity recognition: organizational goals and available resources. In addition, there is another subprocess that is not illustrated in Figure 3.1 but underpins all processes: learning. The learning process permeates each of the processes, from idea generation to realization.

Figure 3.1   Innovation Process

IDEA GENERATION

The first stage in our perspective of the innovation process relates to the creative activity of generating an opportunistic idea. This stage involves the continuous scanning of the internal and external environment for threats and opportunities that might be developed into an innovation by the organization. This stage involves mining the sources of innovation for new ideas and evaluating solutions to identified problems. An organizational culture that encourages creativity and empowerment can significantly support this phase of the process. The input typically stems from a technical insight into a product or process or thoughts about a service. In some cases ideas arise from observed problems that have occurred in the past or may occur in the future. Ideas can also be stimulated by the goals of the organization or an unanticipated opportunity. Various stimuli can lead to the creation of an idea and range from reading magazines and observing problems to visiting other organizations and having informal discussions with colleagues and customers.

OPPORTUNITY RECOGNITION

The second stage of the process is opportunity recognition, in which the opportunity of developing the idea into a new product, process, or service is assessed and evaluated relative to other opportunities. This phase of the process involves deciding which innovative ideas will be pursued by the organization and which are deemed outside its interest. The undertaking of innovative actions is both expensive and resource intensive for any organization, and even large organizations such as 3M and Intel need to choose which ideas to pursue. How this decision is made can be complex and involves tradeoffs, including correlation with the strategic goals and resources available to the organization, the organization's current capability, the mix of innovations already being developed, the actions of competitors, and the emerging signals from the external environment. Similarly, this evaluation of prospective innovations is not a onetime event but occurs periodically during the innovation process to ensure that the organization is investing in positive innovations. Cooper (1986) refers to these decision points as "stage-gates," where unsuitable initiatives are eliminated to allow extra resources to be directed toward more suitable innovations. Two types of error can occur at this phase of the process: An idea that would have been successful for the organization may not be pursued, or an idea that will be unsuccessful for the organization may be allowed to continue. The more damaging of these errors is the latter because the development of this idea will consume scarce resources and prevent another beneficial idea from being developed. In scenarios where a good idea is wrongly abandoned, it is likely that in a supportive culture, this idea will recur at the idea generation phase. The difficulty in this phase of the process is that the organization does

not have a crystal ball to see into the future and therefore cannot know for certain which ideas will be winners or losers. Members of the organization can only make the most enlightened decision they can, based on available knowledge, and continue to periodically screen their portfolio of developing innovations for appropriateness. As a consequence of this phase, ideas are often improved, merged with other ideas, or in many cases shelved or abandoned. An important test for an idea is that it match the goals of the organization and available resources, such as people and money.

DEVELOPMENT

If an opportunity is recognized as appropriate for the organization, then the idea moves to a new stage where it can be developed further. This phase involves the development of the idea or solution into a potential innovation that is ready for launch to its internal or external market. The development of an innovation can be highly resource intensive for any organization. The selection of innovations by an organization is constrained by the budget and the existing portfolio of innovative actions. Similarly, certain innovations may require competencies and skills that are scarce or even absent from the organization, and this scarcity can hinder the implementation of certain innovations. Organizations must carefully manage the innovative actions, ensuring that they are adequately resourced to ensure success. Part of managing the implementation of these actions is constant scanning of the external environment for emerging trends that may alter the trajectory of the innovation. The development phase of the innovation is usually undertaken as a team approach (because of the diverse competencies needed) and involves making the initial idea tangible in a form that best meets market demands. Key activities of this phase can include experimentation, design and development, testing, market analysis, and prototyping. At the end of the development phase, the initial idea has been developed into a tangible product, process, or service that the organization views as capable of meeting user needs. Many potential innovations wait at the end of the development phase for market conditions to be right before they move to the realization phase.

REALIZATION

This phase of the innovation process relates to the launch to the market, which is where the customer makes the final evaluation of the innovation. Understanding customer needs is essential to ensure that the eventual offering to the market meets these needs. A strong alignment between the objectives of the particular innovation and the needs of the customer increases the likelihood that the innovation's initial market adoption will be a success. This fact becomes most pronounced with respect to

technology innovations, where the organization must manage fulfillment of each of the customer segments across the product life cycle (Moore, 1999). Although Figure 3.1 represents the realization phase as following the development phase, in reality these phases overlap. Market information about customer needs is an essential input to the development phase, and information about the innovation's attributes is necessary to begin educating and preparing the marketplace. The objective of the realization phase of the process is to develop an innovation for the market that meets customers' needs and is readily adopted. When the organization is developing a process innovation, the market can be said to be internal. Consequently, the realization phase encompasses activities such as commissioning, validation, and training to facilitate its successful adoption.

LEARNING

Learning is the final subprocess in the innovation process. It requires the organization to analyze the previous phases of the innovation process and identify areas where the process can be improved. In this way, even innovative actions that are abandoned or end in failure can be beneficial because the organization can learn from its mistakes and avoid repeating them in the future. Similarly, the new knowledge acquired from undertaking the prospective innovations can also be used as input to the idea generation phase that may lead to future innovations. Over time the organization's effectiveness at managing its innovation process improves, which will also increase the success of its future innovative actions.

Applying Innovation

Every organization would like to be able to increase the success of its innovative efforts in order to enhance its competitive position for the future. Although many leading organizations have invested significant resources in developing the culture and routines for their innovation processes, most organizations continue to rely on the efforts of a handful of people and chance. An innovative organization is one that can perfect these routines in addition to creating an innovation culture in the organization that engages people. Five key routines can facilitate its management of the innovation process (Dooley & O'Sullivan, 2003). These mimic the five root causes of failure discussed earlier:

- Better definition of goals
- Better alignment of actions to goals

- Greater participation of individuals in teams
- Better monitoring of results
- Greater communications and building of communities

GOALS

The term *goals* refers to the objectives that the organization wants to achieve by engaging in innovation. The organization needs to decide on the goals it will pursue in the future that will enhance its competitive advantage. Defining these goals provides the innovation trajectory for the organization and is a key factor in creating high-impact innovation. We will deal with goals in more detail in Part II. There are a number of ways of defining goals, including the following:

- Statements such as the mission and vision statement
- Needs of stakeholders such as customers and shareholders
- Objectives such as strategic plans
- Indicators of performance such as output and profits

ACTIONS

The term *actions* refers to the expenditure of effort on the part of the organization in developing creative concepts into eventual innovations. Organizations that possess routines that nurture the flow of actions across the various phases can enhance the effectiveness of their innovation process. A key issue is that actions are in some way aligned with the goals of the organization so that they contribute to developing the organization in the direction of its defined goals. We will deal with actions in more detail in Part III. Actions include the following activities:

- Identifying problems and solutions
- Generating ideas
- Managing initiatives and projects
- Managing project portfolios

TEAMS

The term *teams* refers to the resources used for the innovation action. Teams are made up of people who use their skills and other organizational

resources, such as finance, to facilitate the development of innovative actions. The more people engaged in the process, the greater the creative capability and skills available to support the innovative actions. A key part of every team is the available resources in terms of time, knowledge, and equipment, but particularly funding. The issues of funding are dealt with in a number of areas in the book, particularly in Part III. We will deal with teams and aspects of leadership, team performance, and appraisal in more detail in Part IV. There are a number of issues related to achieving greater participation by individuals in teams, including the following:

- Team leadership
- Building structure in teams
- Improving participation by individuals
- Linking the performance of individuals to organizational goals

RESULTS

The term *results* refers to the outcomes of an effort to innovate. There are clearly many things going on at once, and organizations must learn to use techniques that allow them focus on critical activities. The importance of monitoring results allows the organization to assess its ongoing progress and, if necessary, alter the mix of actions it has flowing through the innovation process. We will deal with results in more detail in Part V. The principal results that an organization needs to concern itself with are the following:

- Results of goals such as objectives and indicators
- Results of actions such as ideas and projects
- Results of teams such as where individuals are participating and how their performance review is progressing

COMMUNITIES

The term *communities* refers to all people who share a common purpose of supporting innovation in the organization. This community is often motivated by the defined goals of the organization but can also be influenced by the professional goals of specific individuals. As innovation has become more complex, community has broadened to encompass people in other organizations who are engaged in the innovation. We will deal with communities and community-related issues throughout the book, particularly in Part V. Building community is a time-consuming process and involves key issues such as organization and leadership, communications, and knowledge management.

Innovation Funnel

The innovation funnel provides a solution for effectively managing innovation by controlling the interaction of goals, actions, teams, and results used in the innovation process (Dooley & O'Sullivan, 1999, 2000). The funnel illustrates how goals, actions, teams, and results interact with each other to deliver innovation in any organization (Figure 3.2). The funnel metaphor is not new and can be traced back to the seminal work of Hayes, Wheelwright, and Clark (1988) in relation to their work on the development funnel. The innovation funnel can be visualized as containing four arrows flowing around a funnel. The arrows represent the flow of goals, actions, teams, and results. Actions enter the wide mouth of the funnel and represent, among other things, ideas and potential solutions to problems. These actions flow toward the neck of the funnel, where they are screened in terms of their opportunity for the organization. The neck of the funnel is constrained by two arrows: goals and teams. These constraints loosen or tighten depending on the availability of teams and the goals defined by the organization. Tightly defined goals can be visualized as closing the neck of the funnel, resulting in fewer actions flowing through. The availability of more teams (increased skills or funding) can be visualized as opening the neck of the funnel and allowing more actions to be developed. As actions are implemented, they affect the organization's fortunes. The final arrow reflects this impact. Results flow from the narrow end of the funnel and represent information about the status of goals, actions, and teams and their relationships. This arrow flows back toward goals, representing the impact of results on the process of defining and redefining goals.

An important aspect of the innovation funnel is the relationships between goals, actions, teams, and results. For example, ideas that cannot easily be related to goals will find it difficult to proceed into the funnel. This has two effects. First, the individuals or teams generating the ideas will study the goals more closely in order to generate an idea that matches better. Second, good ideas that are not easily associated with goals will begin to affect the definition of the goals, perhaps ultimately leading to a redefinition
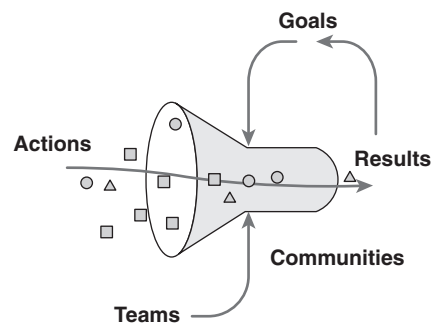

Figure 3.2   Innovation Funnel

of goals in order to allow the good ideas through. This is a natural learning process in an innovation community. When goals change, the generation of ideas that meet these goals increases because the innovation community is now tuned to having new ideas meet the new organizational goals. The process offers the innovation community the ability to change the innovation process in response to changing demands of stakeholders.

Innovation Knowledge

The innovation funnel illustrated in Figure 3.2 can be expanded to include examples of the many ways in which goals, actions, teams, and results can be defined and codified in a simple knowledge management system. The approach adopted in this book is to use simple tables to store and share innovation knowledge. This can very easily be expanded to a sophisticated online knowledge management system. Figure 3.3 illustrates an expanded version of the innovation funnel highlighting a number of unique knowledge elements. Think of each word in this diagram as a worksheet or table in a spreadsheet or as a software module or web part in a knowledge management system.

For example, goals can be defined through knowledge elements such as statements (e.g., a mission statement) and indicators. Actions are defined through elements such as problems, ideas, and projects. Teams are defined and codified through individuals and teams but also through performance appraisals. Results are defined through exceptions and reports. Finally, communities can be defined and codified through knowledge elements such as notices, blogs, and libraries. All of these knowledge elements combine and interact with each other to create a sophisticated knowledge management system for managing innovation in any organization.

Most organizations do not implement all of these knowledge elements at once. They choose only the elements that are relevant for their own particular organization at a particular moment in time. Over time, as the organization builds the various knowledge elements, the power of the system increases as elements interact with each other to illuminate a more holistic innovation management process. This particular innovation funnel will be implemented as part of the activities at the end of each chapter in this book. The remainder of this book will look at many of these knowledge elements in greater detail.

EXAMPLE: Clearview Pharmaceuticals is a small manufacturing company. The innovation team is responsible for mainly process innovations and includes key personnel from all of the main functions in the organization: all managers and some specialists. They meet bimonthly to discuss the progress of their goals and review the status of various projects. They also review any ideas that have been generated by employees that match organization goals. Clearview Pharmaceuticals' mission is "the world-class manufacturing of eye care products and engagement of employees in
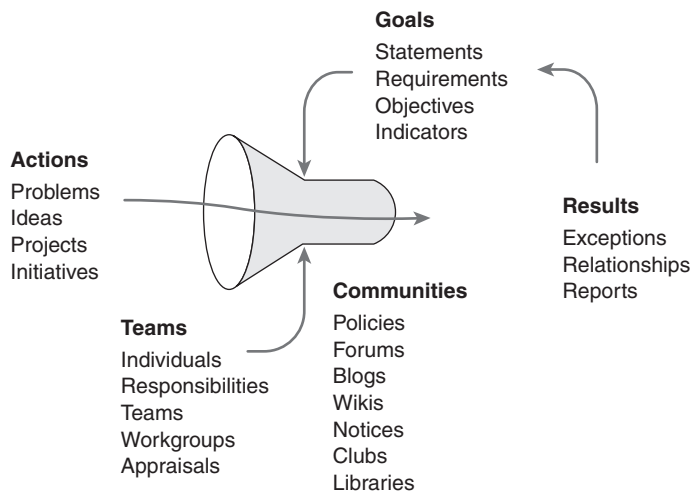
Figure 3.3   Innovation Funnel Expanded

continuous process innovation." Product design is the responsibility of a sister organization at another site. The team has identified four major drivers of innovation: conformance bodies, which impose the need for greater traceability in the production process; their parent corporation, which regularly demands cost reductions; customers, who want greater flexibility and shorter lead times; and suppliers, who expect greater forecasting accuracy in return for shorter lead times and lower costs. The innovation team, listed in Table 3.1, has developed an innovation plan titled "Manufacturing Development Plan 2007–2010." The plan outlines the goals for the 3-year period, a set of performance indicators that are monitored weekly, a dynamic set of projects, and the responsibilities of each person in terms of goal attainment and project management.

Summary

Organizations spend on average just under 4% of turnover on innovation, trying to achieve goals such as better quality, lower lead times, more product variety, and increased market share. Most innovation fails to achieve these goals, and some analysts argue that failure could be as high as 80%. The causes of failure are varied, but some common causes of failure can be found that affect most organizations. These causes can be divided into cultural and process failures. Cultural failures such as poor leadership and organization are clearly important but take time to improve. Process failures such as poor definition of goals and poor alignment of innovative actions with goals are also important but can be remedied in the shorter term through better team behavior and better management of innovation knowledge. Irrespective of

Table 3.1   Innovation Team at Clearview Pharmaceuticals

Individuals	
Name	**Job Title**
Andy Scott	Management Consultant
Colm Griffen	Logistics Manager
Dan Hyland	Marketing Manager
Dave Mahon	IT Manager
Gary Smyth	Senior Engineer
Gutz McFadden	HR Manager
Kevin Staunton	Health and Safety Officer
Mark Ryan	Finance Controller
Mary Joyce	Plant Manager
Mary Kelly	Material Manager
. . .	

the success of an innovation, over time it will be superseded by other inno-vations. The organization must be able to manage its innovation process effectively if it is to deliver ongoing innovations in the future. The innovation funnel offers organizations a structured approach to managing innovation that reduces the effects of some of the key causes of failure while simultane-ously facilitating goal attainment. The rewards for adopting such a simple yet effective system can be significant not only in terms of costs and benefits but, more important, in terms of morale and skill development among partici-pants in the innovation process. As the organization operates the innovation funnel, it identifies areas for improvement and thus can enhance its ability to innovate. The ability to learn faster than your competitors may ultimately be the only sustainable competitive advantage. Creating an innovation that gives an organization temporary competitive advantage may result accidentally or from the actions of people who ultimately move on to other organizations. Sustainable competitive advantage requires that organizations master the management of their innovation process so they can continuously innovate in the future.

The remaining four parts of this book explore the innovation funnel in detail. Their respective chapters are illustrated in Figure 3.4. Part II, "Defining Innovation Goals," contains three chapters that discuss a number of aspects of applying innovation, including how to analyze the environment of the organization, define strategic objectives, and deploy performance indicators. Part III, "Managing Innovation Actions," contains

four chapters that look at a number of applied tools and techniques used for creativity, project management, new product development, and project portfolio management. Part IV, "Empowering Innovation Teams," contains three chapters that explore the application of innovation in areas such as leadership, teams, and performance appraisal. Part V, "Sharing Innovation Results," contains three chapters that look at the application of technologies and techniques for managing knowledge, building communities, and extending innovation beyond the boundaries of a single organization.

Activities

This activity requires you to populate your organization with a team of people who will be responsible for developing your innovation plan. If you have chosen a large organization, then the team will be primarily senior managers and some specialists. If your organization is a small department, then it may be every member of the department plus a few key people from other departments. For your organization, define approximately 10 to 16 employees in your organization. These people will participate in developing and implementing the innovation plan you will develop for your organization. As you progress through the activities, you can revisit this activity and add new employees and functions as needed. Name each person and define his or her role in the organization (e.g., senior technician, general manager). You are also encouraged to define the various functions in your organization and any relationships between them. Copy Table 3.2 into a spreadsheet and complete the fields defined.
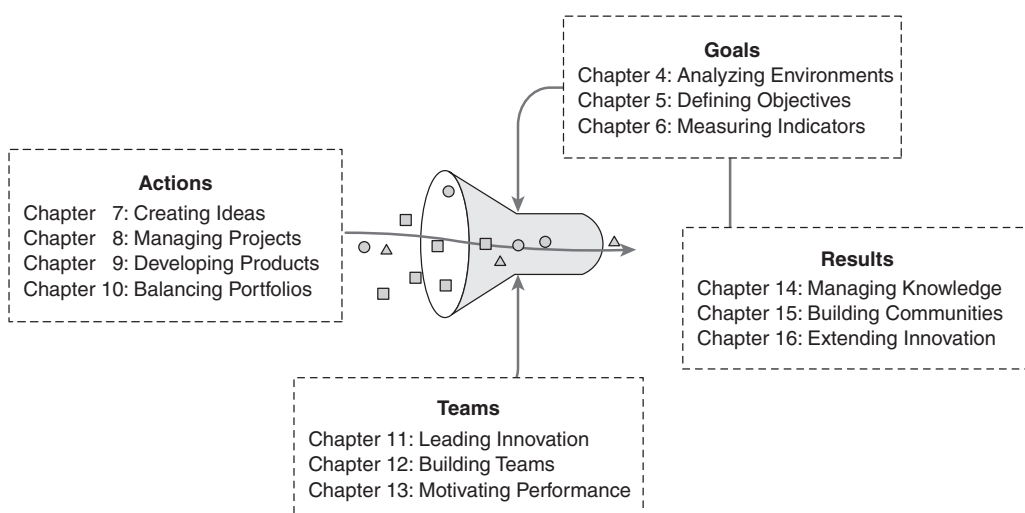

Figure 3.4   Book Chapters

STRETCH: Another element of this activity could be to create an organizational chart. This can be a functional or department chart that identifies people and their responsibilities and reporting structure to each other.

REFLECTIONS

- List some of the main reasons why organizations invest in innovation.
- What are the key stages in the innovation process?
- Explain the opportunity recognition stage of the innovation process.
- What are main causes of failure to achieve innovation?
- What is applying innovation?
- Explain the innovation funnel.

Table 3.2   List Your Team

Team	
Name	**Job Title**

Name: Names of team members (e.g., John Doe)

Job Title: Job title or skill title (e.g., production supervisor)