IDENTIFICATION

Learning objectives

After studying this chapter, you should be able to:

1 Understand the identification capability.
2 Understand differences between intelligence and forecasting capacities.
3 List the advantages and disadvantages of forecasting.
4 Identify the key features of technology auditing.
5 Identify the key features of forecasting.
6 Analyse organizational capabilities.

Introduction

This chapter will focus on the technological capability dedicated to identifying technological opportunities and threats. The identification capability comprises forecasting, which aims to predict the future by conducting audits and collecting data internally and externally about technologies, capabilities and markets. **Technology intelligence** is a recent term that describes the technology forecasting activity, with the addition of all sorts of information on capturing and delivering capacities, which are relevant to identify future opportunities for and threats to firms. Based on the identification activity, firms might reduce the uncertainties surrounding technological decisions. However, technology identification not only requires the development of new technologies but also draws attention to identification of the existing technologies used in the environment as well as the evaluation of the technology being used in the organization to determine whether new application areas exist or not. This technological capability interacts with the strategic

Definition

The goal of identification is to sense/spot technologies and their applications that are (or may be) of importance to the business. In order to identify opportunities, enterprises must constantly scan, search and explore technologies and markets. But accessing information is not enough to build an identification capability; the ability to recognize, sense and shape developments is needed. This requires specific knowledge, creative activity, the ability to understand user/customer decision making and practical wisdom (Teece, 2007).

The literature on identification activities is vast and the terminology is used interchangeably for overlapping activities, such as technology intelligence, technological forecasting, technology foresight, technology scouting, technology exploration, strategic foresight, technology monitoring and technology scanning. This chapter considers the identification capability to be developed through activities encompassing technology forecasting and technology intelligence.

Forecasting means predicting the future. Historically, technology forecasting has been considered to be forecasting the future characteristics of useful technological machines, procedures or techniques (Schnaars et al., 1993). When technological forecasting was used impact of technologies (Braun, 2000). So the forecasting activity needs to perform an **assessment** that is the ==systematic identification, analysis and evaluation== of the potential secondary ==consequences== (whether beneficial or detrimental) of technology in terms of its impacts on ==social, cultural, political and environmental systems== and processes. In other

Although time and cost factors are considered the major hindrances to conducting a forecasting study, there are many advantages (Khalil, 2000; Reger, 2001):

- Observing the total environment to identify developments.
- Estimating the timescale for important events.
- Identifying and evaluating market opportunities or threats.
- Reducing uncertainty.
- Major reorientation of a company policy.
- Improving operational decision making.
- Developing plans, strategies and policies.
- Assisting R&D management.
- Evaluating new products or processes.

Identification processes

To adapt organizational skills and resources to the changing environment, a major step that should be taken is the identification of alternatives. Firms should analyse the requirements of the environment and compare them with the capabilities and resources of the firm, including labour skills, technology and know-how within the organization. In order

future. The key steps involved in mapping the technology and its surrounding environment might be classified under four categories:

1. Technology auditing.
2. Forecasting technology, markets and external environment.
3. Identification of organizational capabilities.
4. Documenting and disseminating the information.

Technology auditing

==**Auditing** should be a detailed evaluation of the available in-house technologies and their status.== It requires finding who needs information and what they want to know, followed with questions such as where and how to look for the information. ==Depending on what is requested by whom, the level of auditing will change.==

Technologies can be classified according to their competitive potential (Lindsay, 2000):

- **Base/enabling technologies** are essential to be in business and are widely exploited by competitors, so their competitive impact is low.
- **Critical/key technologies** are well embodied in products and processes and their competitive impact is high.
- **Pacing technologies** might be under experimentation by some competitors, and if a technology succeeds, its competitive impact is likely to be high.
- **Emerging technologies** are at an early research stage or emerging in other industries and their competitive impact is unknown, although they are expected to be tomorrow's pacing technologies.

Even though this classification implicitly considers technology maturity to some degree, the idea of assessing the maturity of a technology refers to its position in the S-curve or life cycle.

phases in the life cycle:

- *Embryonic*: the direction of technological advance is not clear.
- *Growth*: major technological advance can be expected with regular efforts.
- *Mature*: minor technological advance would require very high efforts.
- *Ageing*: no technological advance can be expected.

Another assessment method for capabilities suggests the use of the assessment of a firm's capabilities in comparison to its competitors along five major dimensions (Lindsay, 2000):

1 Magnitude of internal technological resources, such as personnel.
2 Relevant external resources, such as alliances.
3 Production/operating experience, such as commercial application of technologies.
4 Proprietary position, such as patents.
5 Innovation record, such as the number of new products.

Forecasting technology, market and external environment

The unit of analysis for forecasting might be technologies or markets, as well as the social, economic and political environment in which the company is operating. Even though the unit of analysis varies, forecasting techniques remain more or less the same in predicting the future.

As there are many forecasting methods and they are not the core topic of this book, four major methods of technology forecasting (patent analysis, value analysis, roadmapping and S-curves) are described in Part II.

Many forms of matrices linking technologies, products and markets might be developed through technology roadmapping (Phaal et al., 2004b). There are many forms of technology roadmapping; however, the main idea is to highlight the linkages among markets, products and technology (current and potential). The expected future business/market drivers are identified and then their impact on product features is made. Based on these future product characteristics to be achieved, the list of technologies that will be needed to realize these characteristics is decided.

In general, forecasting techniques might be applicable to social, economic and political developments. However, there are some simple and widely used tools such as scenario analysis that is used in the case at the end

The strategic management field

is full of simple but powerful tools such as STEP, PEST, PESTEL, PESTLE, STEEPLE, SWOT and five-forces analysis (Thomson and Martin, 2010; Rothaermel, 2013; Johnson et al., 2014). We will shortly mention two such tools in this chapter: **STEEPA** (social, technological, economic, environmental, political and aesthetic) and PESTEL (political, economic, social, technological, environmental and legal) analysis. STEEPA is used by business leaders worldwide to build their vision of the future.

The following STEEPA factors may help as a starting point for brainstorming:

- *Social:* population growth rate and age profile, population health, education and social mobility, and attitudes towards these, population employment patterns and attitudes towards work and sociocultural changes.
- *Technological environment:* impact of emerging technologies, the Internet and technology transfer and R&D activity.
- *Economic:* stage of business cycle, current and projected economic growth, inflation and interest rates, unemployment and labour supply and labour costs.
- *Environment:* environmental laws and costs of pollution.
- *Political:* government type and stability, freedom of press, rule of law and levels of bureaucracy and corruption, tax policy and trade and tariff controls.
- *Aesthetic:* design and colour.

There is another version of STEEPA that is titled PESTEL. This analysis is a framework or tool used by marketers to analyse and monitor the macro-environmental (external marketing environment) factors that have an impact on an organization. The result of this is used to identify threats and weaknesses which are used in a SWOT analysis.

There are a number of software tools developed for forecasting purposes. Some examples are specialized programs such as Soritec, Autobox, Forecast Pro and SmartForecasts, as well as Microsoft Excel and many statistical software packages such as Minitab, SAS and SPSS.

Identification of organizational capabilities

In addition to analysing the technology resource base, searching the organizational capabilities of a firm might be a broader exercise to discover the strengths and weaknesses of the internal TM infrastructure. A study in identifying a capability profile indicates four major dimensions of an organizational capability (Lindsay, 2000): facilities and equipment, personnel skills, organizational capabilities and management capabilities.

Documenting and disseminating the information

Even though the importance of forecasting and intelligence activities is seen in the process of these activities, it is important to remember that the goal of identification is to:

> [Help] firms identify, understand and adapt to technological changes that most often occur externally; to anticipate the consequences of technology trends; and to develop well-thought-out plans and policies. (Mortara et al., 2007)

This is why the documentation and dissemination of findings help to filter and present data that result in developing a good 'sensing' capability (Teece, 2007).

Summary

Technology investments are risky and long term, thus the identification activity reduces the uncertainties surrounding technological decisions by forecasting the future. Forecasting markets and technologies provides a rich database in identifying technological opportunities and threats. Technology identification not only requires the development of new technologies but also draws attention to identification of the existing technologies used in the environment as well as the evaluation of the technology being used in the organization to determine whether new application areas exist or not.

In sum, the identification capability of a firm helps to understand the processes, asset position and paths of a firm by conducting audits and searching the future trends with forecasting techniques. This, in turn, helps to build the complementary/interactive TM actions such as selecting from strategic alternatives.

Key Questions

1 What capabilities support identification?
2 What are the advantages and disadvantages of forecasting?
3 What needs to be done for technology auditing?
4 What tasks are undertaken during the process of forecasting?
5 How do organizational capabilities help TM?

CASE STUDY

The importance given to identification, the strategic use of identification and the reasons for developing the identification capability will all influence how the process is structured. Whatever format is chosen, firms eventually conduct activities around auditing and forecasting that help them to identify opportunities.

Baxter Healthcare

The corporate technology sourcing (CTS) unit at Baxter operates in an innovative and creative atmosphere, seeking a broad, diverse range of inputs. The mission of the CTS unit is to monitor new external technological developments and channel this information to the appropriate experts. The actual sourcing process is quite standard; the company networks with contacts in companies, associations, universities and search services. CTS staff look for the unexpected and pass information on to the technical and marketing communities. Often, the technical and marketing people can see different opportunities in the same information. The services of the CTS unit include responding to specific requests, focused technology sourcing, acting as a resource for general technology scanning and generating unsolicited ideas.

The CTS unit considers that every specialist is doing a competent job in sourcing technology in their specialty, but looks beyond these specific contributions to areas that complement normal research efforts. This work requires people who love being creative and who do not have a compelling need to be right all the time.

Baxter's technology sourcing tries to find unusual contacts. For example, the company discovered that Leatherhead Food Research in Leatherhead, England, specialists in food technology and food products, had developed a technology for measuring the temperature of the raspberry filling inside angel cakes as they travel through a 100-ft-long continuous oven. Baxter took this technology, modified it somewhat and now uses it for continuous sterilization processes within the company.

Baxter's most dramatic success came in the 1980s and involved the transfer of Japanese vending machine technology to hospital pharmacy automation. The company knew that hospital pharmacies were looking for a way to dispense regularly prescribed medications accurately, without asking a full-time pharmacist to do such a repetitive task. Using high-quality Japanese vending technology, Baxter was able to develop automatic pharmacy machines that dispense customized medications according to doctors' instructions. Manufactured by Sanyo and sold by Baxter, these machines are now central to a division that has netted Baxter almost $1bn in total sales.

The CTS unit at Baxter does not have a problem with being wrong, since it is wrong 98% of the time. With a budget of only $1m, it is able to identify some 5,000 new ideas and technologies each year. About 100 of these are followed up within the company and 5–10% of projects become commercially successful. This provides a return of $30–40m in new revenue each year – a good return on Baxter's investment in competitive intelligence.

Baxter finds that a company with an open culture, with employees who are open-minded, willing to speculate and willing to share, gains great benefits from its competitive intelligence.