

Chapter 2

Literature Review

The research on corporate foresight has its roots in the term *strategic foresight*. The reason for choosing the term *corporate foresight* in this thesis is to emphasize that the research is aimed at understanding foresight applied in private firms as opposed to the application in the public domain.

As is often the case in new research disciplines, the research on foresight in the corporate context has been conducted using different definitions. The major difference is between scholars who define corporate foresight as a process (Becker 2002:12; Horton 1999:5; Müller 2008:25; Müller-Stewens and Müller 2009:9) and scholars who define corporate foresight as an ability (Slaughter 1998:382; Krystek and Müller-Stewens 1999:175; Tsoukas and Shepherd 2004b:10; Nick 2008:21). The ability is the broader definition, which includes in addition to a process any other means by which firms are enabled to detect, anticipate and respond to changes in their environment, including encouraging every employee to be on the lookout for discontinuous change and to take the initiative.

In this research, I follow the understanding of corporate foresight as an ability, without a particular emphasis on processes or other structural elements of a foresight system. More specifically, I assume the following:

Corporate foresight is an ability that includes any structural or cultural element that enables the company to detect discontinuous change early, interpret the consequences for the company, and formulate effective responses to ensure the long-term survival and success of the company.

Research on corporate foresight has typically been followed by management-science scholars from different research disciplines, including strategic management, technology management, and innovation management. That might be a consequence of the cross-functional character of foresight in the corporate context. Responsibilities for foresighting rest in departments such as strategic management, corporate development, marketing, R and D, innovation management, and controlling (Slaughter 1998:382; Krystek 2007:50; Müller 2008:2). This cross-functionality is also illustrated in Richard Slaughter's definition of *strategic foresight* – a term that he used in a synonymous way to *corporate foresight* – when he lists four outcomes useful to an organization:

Strategic Foresight is the ability to create and maintain a high-quality, coherent and functional forward view, and to use the insights arising in useful organizational ways. For example to detect adverse conditions, guide policy, shape strategy, and to explore new markets, products and services. It represents a fusion of futures methods with those of strategic management (Slaughter 1998:382).

To make more explicit the link between corporate departments and corporate foresight outcomes, their linkage is depicted in Fig. 2.1. In the rectangular boxes, the elements of Slaughter’s original definition can be found, and the circles show the corporate departments that typically are expected to produce the outcomes.

From Slaughter’s definition, we can conclude that strategic management can profit from future insights (i.e., the result of the interpretation of future-related information) to define future strategic directions; that corporate development and marketing can identify and explore new markets; that strategic controlling can identify future risks; and that innovation management can explore new products and services on the basis of these insights.

Research has shown that there is not necessarily a specific corporate foresight department or unit in the corporate landscape (Becker 2002:12–13). Indeed, the strategic management or innovation management often takes over the role of scanning for discontinuous change for the entire company (Daheim and Uerz 2008:325–326).

The same diversity of responsibility in the corporate landscape can be observed in the research landscape of corporate foresight. There are three primary perspectives from which research on corporate foresight has been conducted (see Fig. 2.2).

- The *strategic management perspective*, which includes research on corporate change, ambidexterity (i.e., the ability of companies to excel in both exploitation of current products and markets and exploration of new products and markets), environmental scanning, and decision making.

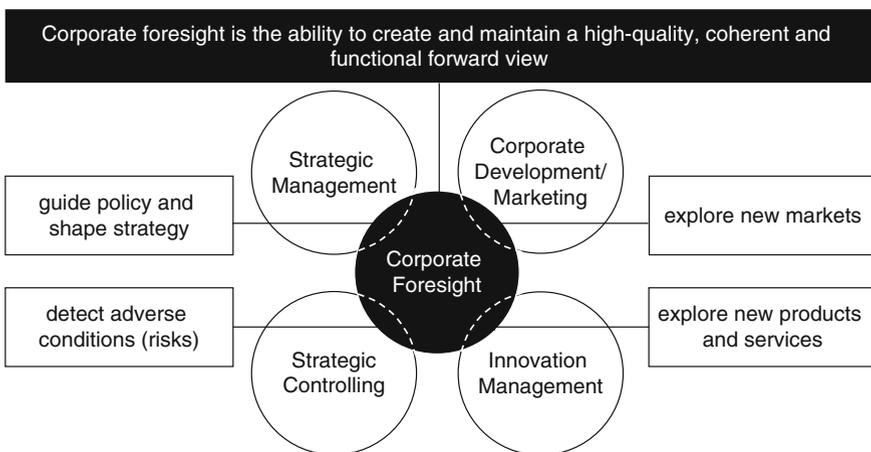


Fig. 2.1 Definition of corporate foresight

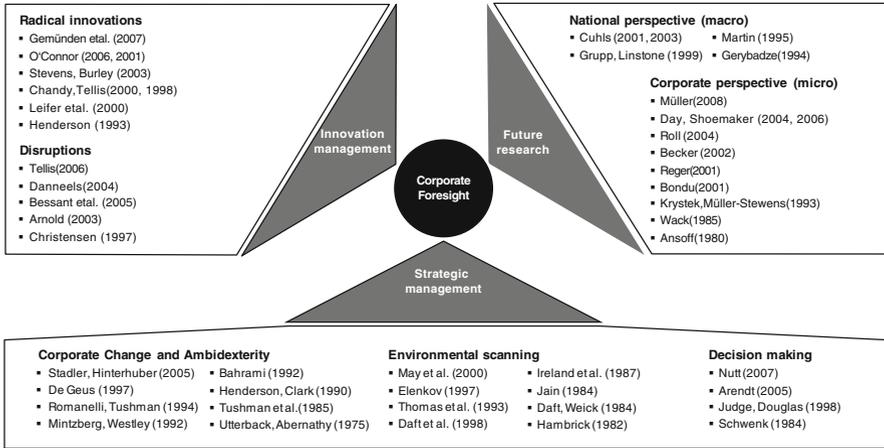


Fig. 2.2 Research perspectives and major authors of works on corporate foresight

- The *innovation management perspective*, in which findings important to corporate foresight have been produced in the research streams on radical innovations and (technological) disruptions.
- And the *future research perspective*, which can be divided into the research stream aiming at studying public foresight activities for national or supranational organizations (macro level) and in the research stream dealing with corporate foresight practices (micro level).

Relevant findings within these three research perspectives will be highlighted and discussed in Sects. 2.1–2.3. In addition, Sect. 2.4 will explain and discuss three major management theories that are relevant to the research on corporate foresight. Section 2.4 will summarize the findings and discuss their implications for the research on corporate foresight.

2.1 Strategic Management Perspective

Research on strategic management aims at understanding how long-term and high-impact changes are planned and implemented in companies. In 1980, Igor Ansoff presented an overview of the historic evolution of (strategic) management systems. Ansoff identified five evolutionary phases and showed that over time there is a correspondence of *dominant assumptions*, *purpose of management system*, and *configuration of the system* (see Table 2.1).

In addition, Ansoff predicts that strategic management systems will move toward real time, emphasizing the need for continuous scanning activities to identify external opportunities and threats and to trigger direct managerial activities. He predicts that the management systems of a company will move toward *strategic*

Table 2.1 Evolution of the strategic management systems

	Control	Long-range planning	Strategic planning	Strategic management	Strategic issue management	Surprise management
Purpose	Control deviations and manage complexity	Anticipate growth and manage complexity	Change strategic thrusts	Change strategic thrusts and change strategic capability	Prevent strategic surprises and respond to threats/opportunities	Minimize surprise damage
Basic assumption	The past repeats itself	Past trends continue into the future	New trends and discontinuities	Expect resistance. New thrusts demand new capabilities	Discontinuities faster than response	Strategic surprises will occur
Limiting assumption	Change is slower than the response	The future will be like the past	Past strengths apply to future thrusts. Strategic change is welcome	The future is predictable	Future trends are OK	Future trends are OK

Periodic
Real time

Source: Ansoff (1980:132)

issue management and later to what he calls *management of strategic surprises* (Ansoff 1980:131–132).

The identification of the need to use weak signals for the early detection of changes in the environment (Ansoff 1980:133) is one of the fundamental findings on which my research on corporate foresight is built. Many scholars have used his concept in the field of future research, most of them using the term *issue management* (e.g., Renfro 1987; Dutton and Ottensmeyer 1987; Schwarz 2007).

In addition, three research streams of strategic management have contributed to corporate foresight research: *corporate change and ambidexterity*, *environmental scanning*, and *decision making*. In the following three chapters, the relevant research streams in strategic management will be discussed and the findings on which my research is built will be highlighted.

2.1.1 Environmental Scanning

Environmental scanning has been guided by the primary assumption that detecting changes in the environment is ultimately the responsibility of top management.

The initial proposition of Ansoff, that strategic management should include the continuous scanning of the environment, was attributed by following research to be an obligation of the chief executive officer (CEO) or the executive board (Hambrick 1982:299; Ireland et al. 1987:469; Daft and Weick 1984:284). It was argued that only the top management is capable of triggering the appropriate responses when the discontinuous change affects the whole company or if it is a cross-divisional phenomenon (Daft et al. 1988:123; Thomas and McDaniel 1990:286; Jennings and Lumpkin 1992:791; Thomas et al. 1993:239). It has also been shown that there are significant differences in environmental scanning concerning the scanning frequency (May et al. 2000:403; Sawyerr 1993:287), information source usage (Elenkov 1997:287), aim (Jennings and Lumpkin 1992:791), and scope (Daft et al. 1988:123).

Further research aimed at identifying possibilities to enhance the quality and quantity of information that could be used for detecting changes in the environment. This research identified an additional role in environmental scanning. This role of boundary spanners was defined as an individual who channels the environmental information into the company and feeds it into the appropriate corporate functions or directly to the top management (Jemison 1984:131; Nochur and Allen 1992:265; Floyd and Wooldridge 1997:463).

A recent study by Danneels showed that environmental scanning positively influences the ability of a firm to build new competencies (Danneels 2008:519), thus building the basis for considering environmental scanning vital to managing discontinuous change.

Conclusion 1. *The interpretation of corporate foresight insights should be done at the top management level, and information gathering should be supported by boundary spanners.*

Empirical evidence was collected that indicates that high-performing companies scan more frequently, use a larger variety of information sources, and tailor their scanning systems to fit the context of the company (Daft et al. 1988:123; Sawyerr 1993:287; Yasai-Ardekani and Nystrom 1996:187).

It can be concluded that the research stream on environmental scanning has produced the foundation for corporate foresight by developing the concept of weak signals and identifying the environment as the source of future-oriented information.

An overview of the cited research is given in Table 2.2 on the following two pages. The table shows the author and year, the data, the type of research, and the findings relevant to corporate foresight. The type of research is also an indicator of the maturity of the research stream. Concerning the research type, a comparison can be made of inductive research, i.e., research aimed at identifying new phenomena, and deductive research, i.e., research aimed at testing phenomena. In inductive research, a further differentiation is made into conceptual work and empirical work using case studies or econometrics.

Concerning the maturity of research on environmental scanning, it can be seen that from the late 1980s all research has been deductive, thus aimed at theory testing (see Table 2.2). This leads to the recognition of a high level of maturity of this research stream. Indeed, the research question on how top management scans for changes in the environment has been researched to a point where additional research would not be expected to produce much more knowledge. But at the same time, it needs to be clarified that the broader research topic of how environmental information is channeled and processed in organizations is not fully understood.

Such research, aimed at understanding how organizations integrate and use environmental and future-oriented information, has been conducted within the managing-the-future perspective and will be discussed in Sect. 2.3.

2.1.2 Corporate Change and Ambidexterity

Within the research stream of corporate change and ambidexterity, empirical evidence indicates that corporate change is characterized by long periods of small, incremental change, which are interrupted by brief periods of discontinuous, radical change (Tushman and Anderson 1986:436; Brown and Eisenhardt 1997:1; Romanelli and Tushman 1994:1141; Huy and Mintzberg 2003:79).

How this change affects companies has been the subject of intensive debate among organizational scholars. On one side of the debate are the organizational ecologists, who argue that individual organizations are characterized by a high level of inertia and are thus mostly unable to adapt to external change. On the other side of the argument, the adaptationists assert that organizations can change and that the duty of senior management is to prepare for external change and take measures to make the organization adapt (O'Reilly et al. 2009:76).

Table 2.2 Research on environmental scanning

Authors, year	Data	Type of research		Findings
		Inductive	Deductive	
Danneels (2008)	Data collected at two points in time 2000 (145 firms) and 2004 (77 firms)		n = 145	Willingness to cannibalize, constructive conflict, scanning, and slack have contemporaneous effects, while scanning also has a lagged effect and slack has a U-shaped lagged effect on marketing and R and D competences
May et al. (2000)	96 Russian executives		n = 96	The scanning mode is influenced by the perceived accessibility of sources
Elenkov (1997)	141 Bulgarian SMEs		n = 141	As strategic uncertainty grows, the usage of personal as well as external information sources increases
Yasar-Ardekani and Nystrom (1996)	179 companies from the manufacturing industry		n = 179	Organizations with effective scanning systems tend to align their scanning designs with their environmental, organizational, and strategic context
Sawyer (1993)	47 CEOs from Nigerian SMEs		n = 47	The greater the perceived uncertainty, the higher the scanning frequency
Thomas et al. (1993)	156 CEOs of hospitals		n = 156	High information use is positively related to the perception of issues as controllable
Jennings and Lumpkin (1992)	44 CEOs from Texan savings and loan associations		n = 44	Companies with a differentiations strategy scan more for opportunities and customer attitudes and less for competitors' threats and political shifts than do companies with cost leadership strategies
Thomas and McDaniel (1990)	151 CEOs of hospitals		n = 151	The contextual factors strategy and information processing structure influence the identification of issues by the management team
Daft et al. (1988)	CEOs and other top level executives of 50 Texan SMEs in the manufacturing business		n = 50	CEOs in high-performing companies scanned more frequently and more broadly than their counterparts in low-performing companies
Ireland et al. (1987)	56 managers from Brazilian and Venezuelan manufacturing companies		n = 56	Perceived environmental uncertainty varied significantly by managerial level as did the perceived relative importance of the issue

(continued)

Table 2.2 (continued)

Authors, year	Data	Type of research		Findings
		Inductive	Deductive	
		Conceptual	Econometric	
Dutton and Jackson (1987)	Conceptual/theoretical paper	✓		Identifies the relationship of threat and opportunity to target and magnitude of organizational responses
Jain (1984)	37 personal interviews in 11 companies; 186 questionnaires from Fortune 500 companies	n = 10	n = 186	Identifies four evolutionary phases of scanning activities Descriptive statistics on scope of scanning, organizational forms, information sources, methods and problems currently faced in environmental scanning
Daft and Weick (1984)	Conceptual/theoretical paper	✓		Organizational interpretation happens at the top-management level on the basis of information channeled into the organization by boundary spanners
Hambrick (1982)	165 executives from six private hospitals, and six life insurance companies		n = 165	The company's strategy does not significantly influence the scanning behavior of top management
Ansoff (1980), Ansoff et al. (1976)	Conceptual/theoretical paper	✓		Discontinuous change can be perceived early by scanning for weak signals in the environment

In support of the theory that companies are unable to adapt, empirical research has shown that firms – even large global champions – often do not survive over long periods of time (for an overview of empirical findings, see Stubbart and Knight 2006:79). This led to the conclusion that – faced with discontinuous change – management is unable to accomplish an adequate adaptation in time. Dew, Goldfarb, and Sarasvarthy conclude that “the strategic manager’s job is in fact futile in the face of environmental disruptions” (Dew et al. 2006:79). Scholars following this line of argument also believe that firm failure is healthful for the industry and should not be prevented – e.g., by governmental aid – as it would weaken the ability of the economy as a whole to adapt to external change (Bellone et al. 2008:754).

The adaptationists argue that there a number of firms that have survived discontinuous change in their industries. De Geus offers many examples (De Geus 1997a:2) and identifies common traits (or capabilities) that have enabled these companies to survive (De Geus 1997b:53–54). Following this line of argument, change in the economy as a whole occurs when firms are aware of changes in their environment and use different mechanisms to retain strategic flexibility and adapt to their environment (Bahrami 1992:33; Hitt et al. 1998:42). Such firms need to have the ability to (1) *exploit* current products and markets and (2) *explore* new products and markets that emerge when discontinuous change occurs (Levinthal 1992:430; Andriopoulos and Lewis 2009:696).

Conclusion 2. *In order to ensure long-term survival, companies need to ensure strategic flexibility and build capabilities to detect discontinuous change in their environment.*

It can be concluded that the strategic management research stream on corporate change and ambidexterity has produced the theoretical basis to understand *the need for corporate foresight*. Companies aiming at strategic flexibility will need capabilities to detect and interpret changes in the environment. Knowing about the change is a prerequisite to successful responses. Corporate foresight can thus be regarded as a mechanism to counterbalance inertia (Volberda and Lewin 2003:2116) and one that should be useful for managing discontinuous change (Van Den Bosch et al. 1999:551; O’Reilly and Tushman 2004:74; Stadler and Hinterhuber 2005:467).

The research stream on corporate change and ambidexterity appears to still need further inductive research (as in Raisch 2008:483). Only some specific phenomena, such as the characteristics of corporate change, have been studied with deductive, econometric means (Romanelli and Tushman 1994:1141). Therefore, the maturity of the research field can be classified as being at the transition from theory development to theory testing (see also Table 2.3).

Raisch et al. propose four major questions that should guide further research on organizational ambidexterity (Raisch et al. 2009:685):

- Should organizations achieve ambidexterity through differentiation or through integration?
- Does ambidexterity occur at the individual or organizational level?

Table 2.3 Research on corporate change and ambidexterity

Authors, year	Data	Type of research		Findings
		Inductive	Deductive	
Raisch et al. (2009)	Conceptual/theoretical paper	✓		Four tensions within the research field of ambidexterity are identified: (1) differentiation vs. integration, (2) individual vs. organizational level, (3) static vs. dynamic perspective, and (4) internal vs. external ambidexterity
Raisch (2008)	Six case studies in leading European companies		n = 6	Proposes normative design recommendations to build ambidextrous organizations
Stubbart and Knight (2006)	Conceptual/theoretical paper	✓		Past empirical findings suggest that the vast majority of firms, even large firms, have a short life expectancy
Stadler and Hinterhuber (2005)	Longitudinal analysis 1980–1990 of Shell, Siemens, DaimlerChrysler		n = 3	An overview of methodological challenges associated with studying survival rates of firms is given
O'Reilly and Tushman (2004)	35 initiatives for breakthrough innovations, in 15 business units in nine different industries		n = 35	The success of corporate change is enhanced by focusing on core corporate values and effectively engaging employees To build ambidextrous organizations firms should establish to separate organizational units (one for exploitation and one for exploration) that are tightly integrated at senior executive level

<p>Huy and Mintzberg (2003)</p>	<p>Conceptual/theoretical paper</p>	<p>✓</p>	<p>Proposes a framework that differentiate corporate change into three modes: dramatic change (revolution), systematic change (reform), organic change (rejuvenation)</p>
<p>Volberda and Lewin (2003)</p>	<p>Conceptual/theoretical paper</p>	<p>✓</p>	<p>Identifies four mechanisms of firms to counterbalance structural inertia: naive selection, managed selection, hierarchical renewal and holistic renewal</p>
<p>Van Den Bosch et al. (1999)</p>	<p>Two longitudinal case studies in traditional publishing companies moving into digital age</p>	<p>n = 2</p>	<p>Organizational form and combinative capabilities influence the ability of a firm to successfully manage discontinuous change</p>
<p>Hitt et al. (1998)</p>	<p>Conceptual/theoretical paper and current economic data</p>	<p>✓</p>	<p>Argues that for developing strategic flexibility firms need to focus on building human capital, develop dynamic core competences and use new organizational structures</p>
<p>De Geus (1997b) and more detail in the book De Geus (1997a)</p>	<p>Historic data on Fortune 500 companies starting in the nineteenth century</p>	<p>n = 700 (approx.)</p>	<p>Average life expectancy of large corporations 40–50 years, but can also reach 700 years Companies that endure are good at “managing for change” and have four common traits: (1) conservatism in financing, (2) sensitivity to the world around them, (3) awareness of their identity, and (4) tolerance of new ideas. Companies that endure need these management skills: (1)</p>

(continued)

Table 2.3 (continued)

Authors, year	Data	Type of research		Findings
		Inductive	Deductive	
Romanelli and Tushman (1994)	Longitudinal study covering 25 microcomputer producers over 3 years		n = 25	valuing people not assets, (2) loose steering and control, (3) organizing for learning, and (4) shaping the human community A large majority of organizational transformations were accomplished by rapid and discontinuous change. Small changes in strategies, structures, and power distributions did not produce fundamental transformations Major environmental changes and chief executive officer succession are the major drivers of transformation
Miller (1993)	Conceptual/theoretical paper	✓		Past success is likely to influence firms in such a way that they become simpler over time and focus more narrowly on a single theme, activity, or issue at the expense of all others
Mintzberg and Westley (1992)	Conceptual/theoretical paper	✓		Introduces a framework for explaining corporate change that includes three modes of change: enclaving, cloning, uprooting
Bahrami (1992)	Single case study on the telecommunications company that later was acquired by IBM	✓	n = 1	Argues that companies need to create strategic flexibility by allowing for decentralization and centralization and stability and dynamism as well as uniformity and diversity

Gersick (1991)	✓	Comparison of six change models from different domains: adult, group, organizational development, history of science, biological evolution, physical science	New research questions are proposed for investigations into organizational change: How is it triggered? How do systems function during such periods?
Henderson and Clark (1990)		Panel data from R and D costs, historic data and interviews on R and D projects at optical photolithographic alignment equipment manufacturer	The internal structures of companies tend to be aligned with the architecture (i.e., the combination of components of its products) and are an important source of inertia
Tushman et al. (1986)		Longitudinal case study data of 40 companies in various industries and of various sizes	Corporate evolution follows patterns of convergence and upheaval. In the convergence phase, companies exploit their business using their own strengths, and in upheaval phases companies exploit new directions triggered by external discontinuities as well as internal company dynamics
Tushman and Anderson (1986)		Various statistical data sources for the cement, microcomputer, and aeronautics industry	Technologies evolve through periods of incremental change punctuated by technological breakthroughs that either enhance or destroy the competence of firms in an industry
Tushman et al. (1985)		Longitudinal analysis in the minicomputer industry covering 37 companies and 396 executives	Strategic reorientation appears to be an important strategic lever affecting organizational performance over time

n = 100

n = 40

Varying for diff. tests

n = 59

- Must organizations adopt a static or dynamic perspective on ambidexterity?
- Can ambidexterity arise internally or do firms have to externalize some processes?

The second question is particularly inspiring for research on corporate foresight. In corporate foresight, it could also be possible that scanning the environment for discontinuous change can be done more effectively by putting every employee on the lookout rather than installing a central scanning unit or system.

The other questions also relate to research on corporate foresight, because corporate foresight can be regarded as an important component of the ambidextrous capabilities of a firm.

2.1.3 Decision Making

A third research stream of strategic management relevant to corporate foresight is decision making. For corporate foresight, it is vital to understand how management decisions are taken and how corporate foresight can contribute to the quality and success of a decision.

A first finding of decision making research is that decisions tend not to be the outcome of linear, conscious, rational processes but the outcome of complex, multi-level information processing (Shrivastava and Grant 1985:97; Hitt and Tyler 1991:327; Corner et al. 1994:294; Bulinge 2006:39). In situations in which companies use processes to ensure rational-comprehensive decision making, the success of these decisions is negatively influenced by environmental dynamism (Hough and Ogilvie 2005:417; Hough and White 2003:481). This leads to a tentative conclusion that to ensure value creation of corporate foresight, it should aim to provide the future insights not only to a structured decision making process but also in indirect ways, for example by communicating the insights directly to some of the decision makers.

Research on leadership has also produced a normative model for decision making, which proposes a certain decision making approach given a certain context (Vroom and Yetton 1973). In this contingency model, the participation of stakeholders in the decision making process was found to be critical to the decision making success (Vroom and Jago 1988:32). For corporate foresight, it can be concluded that stakeholder involvement should be ensured not only in the result review but by the project phase of the foresight exercise.

Another finding in this research stream is that a different kind of decision making is needed for hypercompetitive environments. Bogner found that in hypercompetitive environments, decision making should be enhanced by (1) developing cognitive diversity, (2) implementing rapid decision making, and (3) by using experimental actions (Goll and Rasheed 1997:583; Bogner and Barr 2000:224). A previous study by Bourgeois and Eisenhardt found that in high-velocity environments, companies need to balance three paradoxes: (1) make major decisions carefully, but decide quickly, (2) have a powerful, decisive CEO and simultaneously a powerful

top-management team, and (3) seek risk and innovation, but execute a safe, incremental implementation (Bourgeois and Eisenhardt 1988:816). For corporate foresight, this translates into the need to allow for experimental actions, which would also help to validate the foresight insights.

Research on decision making also found that decision preparation work has a strong influence on the final decision (Dean and Sharfman 1996:368), thus suggesting that foresight could have an impact. In addition, the role of the adviser, i.e., a person who helps in preparing decisions, is expected to influence the decision outcome (Arendt et al. 2005:680). This leads to the conclusion that if corporate foresight plays the role of an adviser and provides information for decisions, then it can be expected to have an impact on the final decision and thus that it can contribute to the quality and success of a decision.

Another finding is that the integration of environmental information is positively related to organizational performance (Judge and Douglas 1998:241), particularly if this information is used to explore different alternatives (Nutt 2007:604) and if it is introduced into the decision making process with a high level of participation (Zehir and Ozsahin 2008:709). For corporate foresight, it can be concluded that participation should increase the probability of usage of the foresight insights.

Conclusion 3. *To ensure that corporate foresight has an impact, insights should be communicated on many levels simultaneously, and decision makers should participate in the corporate foresight activity.*

More details on the individual research findings can be found in Table 2.4 on the following three pages.

2.2 Innovation Management Perspective

The overall question of innovation management research is how companies should build structures and capabilities to continuously create new products, change internal processes, and develop new markets to ensure long-term competitiveness. Within this area, two research streams are of particular importance to corporate foresight: *radical innovation* and *(technological) disruptions*.

Both research streams aim to enlarge the understanding of how fundamental change occurs or can be created. Both mostly take the perspective of large companies. They try to answer this question: How should companies manage endogenous and exogenous fundamental change proactively?

Corporate foresight can be expected to be a mechanism that enables companies to profit from fundamental change. In the following two chapters, the research on radical innovation and on disruptions will be analyzed to confirm the hypothesis that corporate foresight can indeed increase the chances that companies will create value from discontinuous change.

Table 2.4 Research on decision making

Authors, year	Data	Type of research		Findings
		Inductive	Deductive	
Zehir and Ozsahin (2008)	73 large-scale firms operating in the manufacturing industry in Turkey		n = 73	Extensive participation accelerates the pace of strategic decision making
Nutt (2007)	376 strategic decisions (22% from public-sector organizations, 33% from private-sector organizations, and 44% non-profit organizations)		n = 376	The best decision results were achieved when the signal was perceived as a quantitative performance gap and when formal search or negotiation is used to identify alternatives
Hough and Ogilvie (2005)	Sample of managers attending executive trainings seminars		n = 749	Perceptual processes moderate the relationship between judgment processes and decision quality
Arendt et al. (2005)	Conceptual work building on decision theory and the judge adviser role	✓		Development of a CEO-adviser model that emphasizes the influence of decision preparation work on the final decision
Hough and White (2003)	400 decisions in 54 executive teams		n = 400	The relationship between rational-comprehensive, strategic decision making and decision quality is moderated by environmental dynamism
Bogner and Barr (2000)	Conceptual/theoretical paper	✓		A new model for sense making in hypercompetitive environments is presented that follows three rules: (1) develop cognitive diversity, (2) implement rapid decision making, and (3) take experimental actions
Judge and Douglas (1998)	196 companies from various industries		n = 196	Integration of environmental issues into the strategic planning process is

Goll and Rasheed (1997)	62 manufacturing firms		n = 62	positively related to organizational performance The relationship between rationality in decision making and performance is moderated by environmental dynamism
Dean and Sharfman (1996)	Longitudinal field study including 54 decisions in 24 companies		n = 54	The success of strategic decisions is influenced by the process used to make the strategic decisions Decisions are outcomes of complex, multilevel information processing. Decisions are not rationally or consciously constructed
Comer et al. (1994)	Literature review and initial empirical test of the proposed model	✓		Strategic decision models were found to be more complex than described by previous research
Hitt and Tyler (1991)	Random sample of 69 top executives asked to decide on the basis of case descriptions		n = 69	Emphasized the participation of subordinates in decision making to ensure their commitment to the task
Vroom and Jago (1988)	Conceptual/theoretical paper	✓		In high-velocity environments, better decisions will be achieved by mastering three paradoxes: (1) deciding carefully and quickly, (2) having powerful CEOs and simultaneously a powerful top management team, and (3) seeking risk and innovation but executing a safe, incremental implementation
Bourgeois and Eisenhardt (1988)	Four cases in the microcomputer industry		n = 4	Identification of four models of strategic decision making: Managerial autocracy, systemic bureaucracy,
Shrivastava and Grant (1985)	Personal interviews with 61 managers in 32 organizations		n = 32	

(continued)

Table 2.4 (continued)

Authors, year	Data	Type of research			Findings
		Inductive		Deductive	
		Conceptual	Case	Econometric	
Schwenk (1984)	Review of literature in the field of cognitive psychology and cognitive simplification processes	✓			adaptive planning, and political expediency Identifies four phases of decision making: (1) goal definition, (2) problem identification, (3) alternatives generation, and (4) evaluation and selection
Vroom and Yetton (1973)	Observations of management decision-making processes in different contexts	✓			Definition of a normative model to propose a certain decision making style, given a certain context. Stakeholder participation is identified as critical to the acceptance of the decision

2.2.1 *Radical Innovations*

Prior to the interest in radical innovations, research on R and D or new product development (NPD) was mostly focused on understanding how companies can exercise the required rigor that will lead to superior products (e.g., Cooper 1983:2; Rothwell 1992:232; Rothwell 1994:27). Research on radical innovations searches for capabilities that make it possible to generate discontinuous leaps that will bring about a new generation of products (Sorescu et al. 2003:82) that initially outclass those of any current rivals (Ettlie et al. 1984:683; Chandy and Tellis 2000:1; Henderson 1993:248; Bayus et al. 2007:140).

When to classify innovations as being radical is an ongoing discussion in the academic world. Richard Leifer calls innovations radical if they can deliver a fivefold to tenfold increase in product performance, if they introduce entirely new product performance measures, or if they introduce a cost reduction of at least 30% (Leifer 1997:134). More recently, the degree of innovativeness has been understood as a four-dimensional measure, with a market, technological, organizational, and environmental dimension (Gemünden et al. 2007:410; Gemünden and Kock 2009:3).

In the research on radical innovations, at least four major findings are of interest in the context of corporate foresight.

The first finding is that large companies should manage radical and incremental innovation differently. Ettlie et al. show that managing radical innovation, as opposed to incremental innovation, requires other strategies and other organizational structures (Ettlie et al. 1984:682), a finding later confirmed by Kelley in a longitudinal multiple case study (Kelley 2009:487). O'Connor and Veryzer agree and specify that radical innovation management systems should have these three competencies: discover, incubate, and accelerate (O'Connor and DeMartino 2006:489–492). Gemünden and Kock show that process formalization, early cross-functional integration, and top-management support negatively influence the success of radical innovation projects (Gemünden and Kock 2009).

A second finding is that the willingness to cannibalize current products for the sake of new products is required to develop radical innovation (Chandy and Tellis 1998:474; Ghemawat 1991:170). This willingness to cannibalize needs to be created in the minds of the top management. In a study in three high-tech industries, Chandy and Tellis identify three factors that drive the company's willingness to cannibalize: (1) product champion influence, (2) future-market focus, and (3) the presence of internal markets for project selection (Chandy and Tellis 1998:483).

Further research has shown that successful radical innovations in large companies are often achieved by committed individuals (Leifer 1997:134; Stevens and Burley 2003:16) that can be described by traits (champions) or by their role and function (promoters) (Gemünden et al. 2007:412; Walter 1999:537). In addition to the champion and promoter role, boundary spanners and gatekeepers were seen as being critical to innovation success (Allen et al. 1971:36; Reid and de Brentani 2004:170). These two roles are also associated with corporate foresight, where (technology) scouts act

upon these roles by bringing external knowledge into the company. All key individuals in radical innovations should also be suitable as participants in vision-building activities, which have been shown to be a key capability in both management of radical innovations and corporate foresight (O'Connor and Veryzer 2001:231; Schwaier 2001:40).

Another critical factor of success identified by the research is the dominant corporate mindset. It was shown that a corporate mindset which is analytical, proactive, and aggressive positively influences the success of radical innovation projects (Talke 2007:88). Thus, it could be hypothesized that these characteristics could also help companies successfully navigate through times of discontinuous change.

Conclusion 4. *Committed individuals are crucial to radical innovations; they should be used for vision building, and they should be integrated into corporate foresight activities.*

Concerning the maturity of the research stream, Table 2.5 on the following three pages shows that some aspects of managing radical innovations – such as the research on key individuals – has reached the status of tested theory. But other aspects, such as organizational structures for the development of radical innovations, are still being studied with the help of qualitative and inductive means.

2.2.2 Disruptions

Starting from a technological perspective, Christensen built a theory on disruptions that aimed to explain how important performance leaps in technology lead to the failure of large incumbent companies (Christensen 1997). He showed five characteristics of technological disruptions: (1) initial underperformance of emerging technology, (2) new technology generally provides new customer benefit, (3) the emerging technology is first introduced in a niche market, (4) new technology gradually increases performance until it reaches superiority over the established technology and thus is able to capture the mainstream market, and (5) when the new technology reaches superiority the new entrant replaces the incumbent company in the mainstream market.

In the following years, Christensen's theory on disruption has achieved high popularity among managers, but it has also been criticized by scholars for its limited predictive capacity, and thus its limited usefulness in providing managerial guidance (Tellis 2006:34; Danneels 2004:248). Nevertheless Christensen's theses did trigger a research stream that has provided research on corporate foresight with three important findings.

The first finding is that technological disruptions are possibly the most important driver of disruptive change. Christensen illustrated with cases the disruptive potential of emerging technologies (Christensen 1997). By doing so, he followed the line of thought of previous work on technological change that the progress in performance

Table 2.5 Research on radical innovations

Authors, year	Data	Type of research		Findings
		Inductive	Deductive	
Kelley (2009)	Longitudinal case study with 12 leading multinational companies	n = 12		Companies willing to enhance their ability to develop radical innovations created internal programs that (1) have a logical connection to the strategy, (2) use adaptive structures, and (3) have flexible but transparent processes
Gemünden et al. (2007)	146 NPD projects with a high degree of innovativeness		n = 146	Innovator roles have a strong influence on innovation success
Talke (2007)	113 innovation projects		n = 113	For radical innovation, a corporate mindset that is analytical, proactive, and aggressive positively influences new product success
O'Connor and DeMartino (2006)	3-year longitudinal study of 12 large companies		n = 12	Description of different management systems for radical innovations Proposition of a normative framework for building radical innovation capabilities with three steps: discover, incubate, and accelerate
Reid and de Brentani (2004)	Conceptual/theoretical paper	✓		Emphasizes the role of individuals in the radical NPD initiative. Three key roles are discussed: gatekeeper, boundary spanner, and corporate-level decision maker
Sorescu et al. (2003)	380 innovation projects in the pharmaceutical industry		n = 380	The majority of radical innovations come from a minority of firms. The financial rewards of innovation

(continued)

Table 2.5 (continued)

Authors, year	Data	Type of research		Findings
		Inductive	Deductive	
Stevens and Burley (2003)	267 NPD projects collected over a 10-year period		n = 267	vary dramatically across firms and are tied closely to firms' resource base
O'Connor and Veryzer (2001)	11 radical innovation projects in nine large mature organizations	n = 9		The personalities of individuals involved in the initial phase of new business development projects influence project success Identifies visioning as a key capability for enhancing radical innovation success. Four mechanisms are identified: (1) vision building, (2) evangelizing the vision, (3) availability of tools and methods for vision development, and (4) process of validation and internal acceptance
Chandy and Tellis (2000)	Data on 93 significant innovations, collected over a period of 4 years from 250 articles and 500 books		n = 93	After World War II, the majority of radical innovations have been introduced by incumbent companies. Thus the "incumbent curse" does not appear to be as prevalent as often stated
Chandy and Tellis (1998)	194 respondents from three high-tech industries: (1) computer hardware, (2) photonics, and (3) telecommunications		n = 194	Introduction of the "willingness to cannibalize" as a key factor affecting the success of radical innovations. Three driving sub-factors are identified: (1) product champion influence, (2) future-market focus, and (3) internal markets for project selection

Leifer (1997)	Eight technological innovation projects	n = 8	Innovation project success is positively influenced by (1) strong support of committed champions, (2) accessibility and support by top management, and (3) significant or serendipitous events
Henderson (1993)	Panel data from the photolithographic alignment equipment industry	n = 49	Research efforts of incumbents are less productive than of new market entrants
Ettlie et al. (1984)	147 questionnaires and 69 interviews in the food-processing industry	n = 147	For radical innovation, a unique strategy and organizational structure are needed. Suggested characteristics are (1) centralization of decision making and (2) greater top-management support

of a technology follows an s-curve shape – a concept that has also been associated with many limitations in its application (Abernathy and Townsend 1975:379; Brockhoff 1993:328; Sood and Tellis 2005:152). It was also shown that a technological discontinuity is followed by a phase of technical variations, allowing incumbents and new market entrants to propose new solutions until a dominant design emerges (Anderson and Tushman 1990:604).

More recent research on disruptions has been extended to disruptions with a low level of technological change (Govindarajan and Kopalle 2006:12), product disruptions, and disruptive business models (Markides 2006:19–20). It has also been noted that successful mechanisms with which companies survive disruptions will differ from one firm to another and thus a set of common characteristics should be identified in order that appropriate measures may be proposed (Sandström et al. 2009:14).

A second finding is that large incumbent companies need specific structures to succeed in times of disruptive change (Henderson 1993:248). Through case-study research, many examples have been collected of incumbents failing to catch up to small new companies that have entered the market (Christensen 1997; Markides 2006:20; Arnold 2003:111). Through these observations, a paradigm has been created. According to the paradigm, incumbent companies are too slow and ignorant to compete with smaller, more agile companies (Paap and Katz 2004:20) or produce adequate responses in times of crisis (Weick 1988:305). Although the work of Chandy and Tellis (2000) has provided evidence that the paradigm needs to be approached with care, the general direction of practitioners' and academics' suggestions points to the need to enhance strategic flexibility by building more agile organizational structures.

Another similar concept is absorptive capacity. Zahra and George describe absorptive capacity in this way (Zahra and George 2002:185):

... pertaining to knowledge creation and utilization that enhances the firm's ability to gain and sustain a competitive advantage.

It has also been shown that absorptive capacity is positively related to organizational learning and innovation capacity (Garcia-Morales et al. 2007:546; Nieto and Quevedo 2005:1153) and that it is increased by external scanning (Gassmann and Gaso 2005:261; Lichtenthaler 2009:822), alliances (Noke et al. 2008:129), and corporate venturing activities (Dushnitsky and Lenox 2005b:615; Rohrbeck et al. 2009a:50; Day 1994:148).

Conclusion 5. *Large incumbent companies tend to be slow and ignorant and need to build dedicated structures for detecting and proactively managing discontinuous change.*

Research on disruptions has also pointed out two major success factors when attempting to manage discontinuous change. First, the ability to forecast and foresight, i.e., being able to gather information on the potential impact and direction of emerging discontinuities (Arnold 2003:171; Bessant et al. 2005:1374), and

second, the ability to create insight, i.e., interpretation of the potential discontinuity in a collaborative fashion, so that the insights become actionable (Burt 2007:747).

From Table 2.6 on the following three pages, it can be seen that the maturity of research on disruptions is still in the inductive theory development stage. Most research is still conducted by means of case studies or is purely conceptual (e.g., Adner and Zemsky 2005:229; Danneels 2004:246; Adner 2002:667).

2.3 Future Research Perspective

2.3.1 A Brief Overview of Definitions and Relevant Terminology

The term *future research* is used here, even though it is not an ideal term. It is used as a term to describe the whole range of research conducted to help organizations, individuals, and governments explore, prepare for, and respond to changes in the environment. Many scholars have aimed to differentiate terms used in this broad field (e.g., Müller 2008:23–30; Nick 2008:31; Müller-Stewens and Müller 2009:6–12). So far, the attempts to develop a common definition have not produced clarity, and many scholars use terms synonymously.

An additional challenge is faced by scholars willing to use findings from different linguistic literature bases. Table 2.7 does not aim to produce clarity on terminology but to provide some guidance for scholars willing to follow up on the literature in German, French, and English that I reference in this research.

One reason for the lack of commonly agreed on and clearly used terminology may be that research is driven by various perspectives. Another reason is the lack of interchange and cross-referencing between the different research streams. For example, scholars taking the strategic management perspective are rarely cited by researchers with an innovation management perspective or a future research perspective.

2.3.2 National Economy Perspective (Macro)

Although this research is aimed at developing a maturity model and identifying best practices on corporate foresight, some valuable results of national foresight research can be used. After the period of economic growth that followed the Second World War, many national governments were looking for ways to boost their national economies. Governments therefore commissioned technological foresight projects (for an overview, see OECD 1996). Their aim was to identify promising emerging technologies and direct national research funding to those technologies that maximized the economic benefit (Martin 1995:139; Blind et al. 1999:15; Durand 2003:161; Van der Meulen and Lohnberg 2001:680) and more generally that enhanced the quality of life (Anderson 1997:676). Today, with many national

Table 2.6 Research on disruptions

Authors, year	Data	Type of research		Findings		
		Inductive			Deductive	
		Conceptual	Case		Econometric	Econometric
Lucas and Goh (2009)	Case study on Kodak, including interviews and much secondary data		n = 1		Kodak did perceive the discontinuous change in the photography industry and invested heavily in digital photography, but middle managers and the organizational culture blocked a transition	
Burt (2007)	Action-based intervention in a scenario analysis in the energy industry		n = 1		Top managers were aware of the different factors that have the potential to create major disruptions The scenario analysis provided a structured approach to collaboratively identify and assess the potential disruptions Broadens the definition of disruptions by including so-called low-end disruptions that are not based on new technologies Argues that ex-post measures of disruptiveness can be used to develop normative management guidance	
Govindarajan and Koppalle (2006)	Conceptual/theoretical paper	✓			Introduces the differentiation of the technological, business-model and product disruption for enhancement of theory on disruptions. Shows that they differ in their emergence, have different competitive effects, and require different responses	
Markides (2006)	Conceptual/theoretical paper	✓			Identifies four influencing factors on threat level arising from disruptions: (1) rate of technological advance, (2) number of	
Adner and Zemsky (2005)	Mathematical modeling and simulation	✓				

<p>firms using the technologies, (3) relative market-segment size, and (4) firm's ability to price discriminate</p>		<p>Tellis (2006)</p>
<p>Laments the ambiguity of Christensen's definition of a disruptive technology and its usefulness for ex-ante predictions, particularly in the light of problems with the linearity of performance paths of emerging technologies</p>	<p>✓</p>	<p>Conceptual/theoretical paper</p>
<p>Identifies many sources of discontinuous change and suggests that companies need to build new capabilities to manage discontinuous innovations</p>	<p>✓</p>	<p>Bessant et al. (2005)</p>
<p>Technological evolution does not follow the idealized-curve shape but follows a sequence of periods of fast improvement and periods with little improvement</p>	<p>n = 14</p>	<p>Sood and Tellis (2005)</p>
<p>Suggest that incumbents in most cases are well aware of the drivers and technologies that will create disruptive change, but for different reasons fail to take them seriously or fail to take appropriate actions</p>	<p>n = 3</p>	<p>Paap and Katz (2004)</p>
<p>Questions the predictive capacity of Christensen's (1997) theory of disruptions</p>	<p>✓</p>	<p>Danneels (2004)</p>
<p>Identifies success factors for managing disruptive change: (1) ability to forecast, (2) management focus, (3) strong financial base, (4) innovating in a modular fashion, (5) first to market, and (6) late market entry</p>		<p>Arnold (2003), Danneels (2004)</p> <p>58 companies from the machine-tool industry</p>

(continued)

Table 2.6 (continued)

Authors, year	Data	Type of research				Findings
		Inductive		Deductive		
		Conceptual	Case	Econometric	Econometric	
Adner (2002)	Mathematical modeling and simulation	✓				Introduction of preference overlap and preference symmetry to enhance understanding of disruptive dynamics Identifies technologies as a key driver of disruptive change
Christensen (1997)	Many case studies		Multiple			Defines technological disruptions as (1) initially underperforming established technologies, (2) products based on the new technology satisfy only a niche market, (3) after R and D investments the technology outperforms the existing solutions, and (4) established incumbents fail to catch up to new market entrants that grew through the application of the new technology

Table 2.7 Overview of terminology

Description	English	French	German
Indicators that make it possible to see change early	Weak signals	Signaux faibles	Schwache Signale
Identifying several possible futures	Futures studies	Prospective	Zukunftsforschung
Predicting the future by e.g., extrapolation of a current trend	Forecasting	Prédiction	Prognose, operative Frühaufklärung
Scanning for weak signals in the environment	Environmental scanning, peripheral vision	Veille stratégique	Früherkennung
Scanning for changes in the environment and producing adequate responses	Strategic foresight, strategic issue management	Intelligence économique	Strategische Frühaufklärung
Scanning for changes in the environment and producing adequate responses in the corporate context	Corporate foresight	Intelligence économique en entreprise	Frühaufklärung in Unternehmen

boundaries being blurred by free-trade zones and common markets such as the European Union, foresight exercises are increasingly run on the level of supranational bodies (Loveridge 2001:789–790).

The national foresight projects not only engage in the identification and assessment of emerging technologies, but also trigger research on the methods and practices of exploring the future. From a corporate foresight perspective, two major outcomes are of importance.

The first contribution of past research is a *large toolbox of future research methods* (Heraud and Cuhls 1999:69; Schwarz 2009:291). Many methods, such as the Delphi analysis and trends extrapolation, have been pioneered by national foresight exercises (Breiner et al. 1994:141; Martin 1995:143; Grupp and Linstone 1999:87–89). Various methods have been employed, and recently the Technology Analysis Group, an association of researchers on national foresight practices, has developed a comprehensive overview of different methods (Porter et al. 2004:290–291). Earlier, Gordon and Glenn of the United Nations Millennium Project edited a compact disc that contains detailed descriptions on several foresight methods (Gordon and Glenn 2003).

Another finding important to corporate foresight comes from studying the evolution of national foresight practices (Gerybadze 1994; Martin 1995:139). In the 1970s, the focus was on using mathematical modeling and trend extrapolation to make predictions about the evolution of technology. This changed in the 1980s, when important limitations (particularly a weakness in identifying new technologies and disruptive change) of using past data and extrapolating them into the future became apparent. In the next evolutionary step of national future studies, expert

opinions were included, and the Delphi analysis became the method of choice (Grupp and Linstone 1999:90; Cuhls 2001:555; Kameoka et al. 2004:579). Today foresight projects have moved *from prediction to exploration of possible developments* (McMaster1996:150) and include more qualitative methods (Grupp and Linstone 1999:84; Miles 1999:21).

Another element that is being added into current foresight projects is participation. The reason behind the addition is the need to involve stakeholders early in order to ensure that the insight creation is followed by actions. From the point of view of governments, foresight projects should result in an increase in R and D activities in the identified technological areas (Cuhls 2003:93; Konnola et al. 2007:622–623). That is to say that public research and companies are expected to be more willing to engage in R and D activities when they have participated in the process of defining the R and D priorities (Salo and Cuhls 2003:79–82; Camerona et al. 2008:279). In that respect, online tools are expected to help by making it possible to increase the participation by decreasing the cost and increasing the convenience (Hilbert et al. 2009:892).

Another challenge for national foresight programs is linking the activity to measures of success. Scholars report on the ongoing process of finding appropriate criteria for measuring the impact of foresight exercises (Georghiou and Keenan 2006:775). While some lament the limited prediction accuracy (Eto 2003:231) others see the desired outcome more in the foresight process itself (Blind et al. 1999:33), consequently demanding that success be judged more by the level of social interaction and the resulting R and D collaborations that they have triggered (Sanz-Menendez et al. 2001:661; Meulen et al. 2003:231). Others have developed multi-criteria frameworks that can also serve as a basis for measuring the impact of corporate foresight activities (Amanatidou and Guy 2008:552).

Conclusion 6. *To make corporate foresight actionable, it should move toward qualitative studies and the active participation of the internal stakeholders.*

Concerning the maturity of future research on the national economy perspective, it can be observed in Table 2.8 that past research has been conducted exclusively by means of case studies and conceptual work. It can be concluded that the need for method development and the identification of best practices remains, before research will move toward theory development and subsequently to theory testing.

2.3.3 *Corporate Perspective (Micro)*

As is the case with national foresight, the examination of the evolution of corporate foresight practices provides some important insights on how foresight is managed today. Van der Duin and Den Harthig compared the evolution of future research in companies with their innovation processes (Table 2.9). In their analysis, they show that the technology focus of corporate innovation management in the 1950s and 1960s was equally present in the way companies were exploring the future. And while the innovation processes changed over time to include the market perspective

Table 2.8 Research from national economy perspective (macro)

Authors, year	Data	Type of research		Findings
		Inductive		
		Conceptual Case	Econometric	
Hilbert et al. (2009)	Case study on a three-round Delphi analysis and multiple countries	n = 1	Deductive Econometric	Shows how online tools can be used to increase participation in foresight exercises
Amanatidou and Guy (2008)	Conceptual/theoretical paper	✓		Proposes a set of evaluation criteria to assess the success of national foresight programs
Georghiou and Keenan (2006)	Three case studies and conceptual work	n = 3		Emphasized the need to adapt national foresight programs to their individual context
Porter et al. (2004)	Conceptual/theoretical paper based on a working group of technology futures analysis experts	✓		Overview and classification of futures research methods, applicable both on a micro and macro level
Cuhls (2003)	Case study of the German national foresight activity	n = 1		Description of the German national foresight activity that moved from a Delphi analysis to more participatory study that aims at planning new R and D collaborations
Cuhls (2001)	Case study of the Japanese foresight activity	n = 1		Evaluation of the Japanese foresight activity that is based on Delphi analysis
Blind et al. (1999)	Comparison of the Japanese and German national foresight program	n = 2		In a Delphi analysis, the process is a valuable experience in itself, because experts are forced to think critically about future developments in science and technology

(continued)

Table 2.8 (continued)

Authors, year	Data	Type of research				Findings
		Inductive		Deductive		
		Conceptual	Case	Econometric	Econometric	
Heraud and Cuhls (1999)	Three case studies on the national foresight exercise in France, Spain, and Italy		n = 3			There exists a rich methodological base throughout the European national foresight programs. Many countries have developed their own methods and approaches
Grupp and Linstone (1999)	Comparison of 12 national foresight systems based on literature and expert knowledge		n = 12			National foresight activities move from mathematic modeling toward qualitative, scenario-based approaches, while Delphi analysis prevails as the "backbone" of national foresight activities
Martin (1995)	Seven case studies		n = 7			Comparison of the national foresight activities of Japan, the United States, the Netherlands, Germany, Australia, New Zealand and the United Kingdom
Gerybadze (1994)	Conceptual/theoretical paper	✓				Links evolution of foresight activities to generations of R and D and innovation management

Table 2.9 Generations of innovation management and futures research

	Innovation processes	Future research
1st Generation (1950s–1960s)	Technology push	Technology forecasting
2nd Generation (1960s–1970s)	Market pull	Technology assessment
3rd Generation (1970s–1980s)	Coupled innovation processes	Explorative futures research
4th Generation (1980s–present)	Innovation in systems or networks	Networked or systemic futures research

Source: Van der Duin and Den Hartigh (2007:12)

and later networking as a way to boost the company's own innovation capacity, so did the future research activities. Overall, the assumption of corporate foresight is that earlier detection of external changes will allow the company to create a temporal competitive advantage (Peterson 2002:486; Tsoukas and Shepherd 2004a:137) and increase overall competitiveness (Lackman et al. 2000:17).

For this research on corporate foresight, the analysis of past literature provides three major insights.

First, it can be observed that there is a trend toward *thinking about uncertain and possible futures*. Strategic management was primarily about planning how the company should be changed toward a desired new state and ensuring the transition by controlling the process (Ansoff 1980:132). With the introduction of scenario analysis, companies such as Royal Dutch Shell showed a different understanding of the future. Shell saw the future as something that can not be planned, recognizing that by nature the future is uncertain (Geus 1988:73; Schoemaker and Heijden 1992:41). In consequence, Shell shifted its strategic planning toward scenario analysis, which makes it possible to identify different possible futures in order to be able to judge today's decisions based on their robustness in terms of success in the various possible futures (Wack 1985:73; Van der Heijden 2005:3–5). This has been a shift in the perception of the future as well as a paradigm shift in strategic management. In consequence, corporate foresight has also changed from being focused on predicting change to exploring possible changes (Krystek 2007:52; Mietzner and Reger 2005:220).

It has also been argued that the dominant logic in organizations hinders the acknowledgement of change (Prahalad 2004:171) and hinders acceptance of alternative development paths. The task, therefore, of corporate foresight would be to create doubt about basic assumptions in the firm by running participatory foresight exercises (Blackman and Henderson 2004:265–265).

Additional benefits of using participatory methods to explore possible futures arise from the process itself. It has been shown that the process of scenario planning can play the role of strategic conversation (Chermack et al. 2006:767; Chermack et al. 2007:379) and enhance organizational learning (Cairns et al. 2006:1010; Costanzo 2004:219).

In line with the findings of research on radical innovation, the corporate foresight research also discovered the *high importance of involved actors*. The boundary-spanner – later also called scout – emerged as an important actor to transport

external information into the company (Daft and Weick 1984:285). The foresighters are responsible for running foresight activities and facilitating the transition of weak signals to issues to recommendations and finally for triggering actions. A benchmarking study on corporate foresight practices at 24 large and small and medium-size enterprises (SME) blamed the failure of corporate foresight systems largely on the lack of needed skills of foresighters (Bondu 2001:124).

In line with the findings in decision making, corporate foresight research has also adopted the paradigm that *participation is crucial* to the usage of the foresight insights (Barker and Smith 1995:27; Scapolo 2005:1059). It has been shown that in order to ensure the success of foresight activities, experts and decision makers need to be integrated into the process (Schwarz 2005:22; Van der Helm 2007:4; Oner and Gol 2007:451; Harroussi 2004:4). To do so, motivation mechanisms need to be put in place and adapted to meet the expectations of each stakeholder and be aligned to the corporate context (Salo 2001:694; Stuckenschneider and Schwaier 2005:776).

Conclusion 7. *Successful corporate foresight is built on its actors. Ensure the usage of foresighters with desirable characteristics and traits and the participation of major stakeholders.*

Although there exists a sound body of knowledge about technological foresighting (e.g., Ashton and Klavans 1997; Lichtenthaler 2002; Savioz 2002; Carlson 2004; Reger 2006), the way in which an integrated corporate foresight practice should be organized – including scanning the political, technological, competitive, consumer, and socio-cultural environment – remains an open question. Past research has been either conceptual (Krystek and Müller-Stewens 1993; Liebl 1996; Day and Schoemaker 2004b; Pillkahn 2007) or inductive (see Table 2.10). In the inductive research, Josse 2004 and Daheim and Uerz 2006 used surveys to explore the implementation of corporate foresight practices. Schwarz (2007) used a Delphi analysis to capture experts' opinions on future directions in corporate foresight, and many other authors used case studies to broaden the knowledge about the configuration of corporate foresight systems. These case studies have been conducted in the insurance industry (Käslin 2008) and the airline industry (Roll 2004) and with cross-industry samples (Bondu 2001; Nick 2008; Müller 2008).

One major methodological shortcoming of past research has been the exclusive usage of the foresight manager as sole informant. Of the 14 empirical studies mentioned in Table 2.10, only two have used internal customers (i.e., the internal stakeholder, who uses the foresight insights for decision making or triggering managerial actions).

Conclusion 8. *There is a need for a common framework for corporate foresight research and coverage of both the foresight manager's and the foresight customer's perspective.*

It can be concluded that corporate foresight research – like foresight on the macro perspective – is still driven by the aim to identify successful methods and processes. To enhance the maturity of corporate foresight research and to move closer to theory development, a common framework with its constituting elements

Table 2.10 Research from corporate perspective (micro)

Authors, year	Data	Type of research		Findings
		Inductive		
		Conceptual Case	Deductive Econometric	
Müller (2008)	Five case studies (DaimlerChrysler, TUI, BASF, Deutsche Bank Research, Hilti)	n = 5		Description of how companies adapted their foresight processes in response to a change in contextual factors
Davis (2008)	Interviews of experts at 20 large companies		n = 20	Identification of barriers to the implementation of corporate foresight systems in large companies and some findings on the impact of corporate foresight
Käslin (2008)	Four case studies in insurance industry (Swiss Re, Münchner Rück, Allianz, Zurich)	n = 4		Important success factors of corporate foresight activities are (1) culture that supports openness toward the environment, (2) usage of many information sources, and (3) central interpretation and processing unit
Nick (2008)	Ten multinational companies with headquarter in Europe and one longitudinal action based case study	n = 10 + 1		Development of a typology for roles of corporate foresight in respect to strategic and innovation management
Rollwagen et al. (2008)	Action-based case study at Deutsche Bank research	n = 1		Proposition of a set of assessment criteria for corporate foresight practices and success criteria for implementation
Hergert (2007)	Action-based case study at Volkswagen	n = 1		Descriptive analysis of internal cognition processes in corporate foresight
Schwarz (2007)	Delphi study with 64 foresight experts from industry, academia and consultancy		n = 64	Growing importance of future studies in corporate context
Chermack et al. (2007), Chermack et al. (2006)	Survey data from participants in a scenario planning exercise	n = 1		Some evidence suggests that scenario planning might improve strategic conversation and enhance organizational learning

(continued)

Table 2.10 (continued)

Authors, year	Data	Type of research		Findings
		Inductive		
		Conceptual Case	Deductive Econometric	
Daheim and Uerz (2006)	40 foresight professionals from multiple industries		n = 40	Overview of configurations of foresight practices. Introduction of a historic evolution of corporate foresight
Roll (2004)	Four case studies in the aviation industry (two network carriers, one regional carrier, and one low-cost carrier)	n = 4		Perception of a high need for corporate foresight, but limited capabilities
Josse (2004)	24 respondents from travel agencies and 30 experts from tourism industry		n = 24	Comparison of survey results with past findings from the literature
Day and Schoemaker (2004b), Day and Schoemaker (2006)	Conceptual/theoretical paper ✓			Introduction of a peripheral vision (largely synonymous with corporate foresight) process framework Using flashlight metaphor to emphasize that any scanning mode will inherently neglect peripheral information, after being directed at a specific target area
Becker (2002)	18 case studies at multinational companies known to have strong foresight capabilities	n = 18		Introduction of a typology of corporate foresight practices ranging from “think tank” (large scope and high degree of specialization), through “observatory” to “collecting post” (small scope and low degree of specialization)
Burmeister et al. (2002)	Four case studies and survey data with 26 respondents	n = 4	n = 26	Data on motivation, goals, information sources, methods, organization setting, impact, and future challenges of corporate foresight
Reger (2001a)	74 interviews in 26 multinational companies	n = 26		Technology foresight in companies is increasingly conducted from a broader perspective to include also economical, social, environmental, and legal aspects

Bondu (2001)	24 mostly large companies	n = 24	The failure of implementing stable foresight systems is blamed on the absence of measures of success and a lack of focus on foresighters' skills and traits
Liebl (1996)	Conceptual/theoretical paper	✓	Development of a model for perception of discontinuities and integration with inside-out and outside-in perspective of strategic management
Krystek and Müller-Stewens (1993)	Conceptual/theoretical paper	✓	Conceptualization of discontinuities and practical advice on how to implement foresight methods and systems
Wack (1985)	Case study on Shell's scenario-based foresight activity	n = 1	Emphasizing the need for and benefit of foresight to educate managers to think about an uncertain future
Krubasik (1982)	Conceptual/theoretical paper	✓	Framework to link technology forecasting based on s-curves with portfolio management for R and D priority setting

is needed. Such a framework can be an important step for developing testable constructs and hypotheses and thus can lead the transition to deductive research.

2.4 Management Theories

When engaging in scientific research, scholars aim to advance the existing knowledge base. The philosopher Thomas Kuhn defines science as “research firmly based upon on or more past scientific achievements, achievements that some particular scientific community acknowledges for a time as supplying the foundation for its future practice” (Kuhn 1970:10). When scientific research meets the two characteristics of being (1) sufficiently new and (2) sufficiently open-ended to attract additional research, it creates a paradigm that is followed by other researchers (Kuhn 1970:10). Such paradigms help researchers build on previous knowledge and serve as theoretical frames. Such theoretical frames are also often referred to as theories, and they help guide and position the research. For this study, the theoretical frames are (1) the contingency theory, (2) the resource-based view, and (3) dynamic capabilities.

2.4.1 Contingency Theory

The core idea of the *contingency theory* is that there is not one best way to organize a company, but that managers need to aim to match their management actions to contingency factors. The idea originated with the work of Woodward, who argued that technologies directly determine differences in organizational attributes such as span of control, centralization of authority, and the formalization of rules and procedures (Woodward 1958). This finding was revolutionary at a time when general management theory was dominated by the idea that given a certain goal there is one best way to organize a company.

This initial work triggered a whole school of thought in which scholars defined technology as the contingency factor and studied its impact on organizational factors (e.g., Harvey 1968; Pennings 1975). Other researchers applied the theoretical frame to other contingency factors and thus showed its applicability to other domains. In this line of research, the books of Lawrence and Lorsch and Khandwalla are possibly the most prominent works (Lawrence and Lorsch 1967; Khandwalla 1977). Their research led to the increasing popularity of the contingency theory and motivated its application in additional domains.

Today, the contingency theory is one of the most prominent management theories and has been applied to many research domains (Donaldson 1999:51). The major criticism concerning the contingency theory is about its deterministic nature (Schreyögg 1978). Particularly Lawrence and Lorsch expected the optimal organizational structure to be determined entirely through the contingency factors (Lawrence and Lorsch 1967), excluding the possibility that the organization itself could change the contingency factors or that there is more than one optimal way. The organization was thus expected to have only the option of adapting itself to the

external contingency factors, success being determined by the ability of a firm to adapt effectively and in a timely manner (Child 1972:17–19; Child 1997:43).

For research on corporate foresight, the contingency theory can be applied to observe the relationship between contextual factors (the contingency factors) and the corporate foresight capabilities (configuration, which is dependent on the contingency factors). In addition, it would be interesting to investigate whether certain combinations of contextual factors and corporate foresight capability have more impact (effectiveness measure of the contingency-structure-fit) than others. For the development of the maturity model and the description of best practices, this leads to two conclusions.

Conclusion 9. *The ideal corporate foresight capability mix depends on contextual factors.*

Conclusion 10. *The success of best practices depends on contextual factors.*

2.4.2 Resource-Based View

The *resource-based view* builds on the central concept that the ability of a company to compete successfully against rivals depends on certain (strategic) resources (Barney 1991:99; Wernerfelt 1984:171). This means that in contrast to the contingency theory it is not the ideal fit between contingency factors and organizational structure that determines the competitive advantage, but certain resources (Moore 1993:75). The first to introduce this concept was Penrose, who explicitly stated the importance of certain resources for value creation (Penrose 1959:31):

The business firm [...] is both an administrative organization and a collection of productive resources; its general purpose is to organize the use of its 'own' resources together with other resources acquired from outside the firm for the production and sale of goods and services at a profit.

In order to provide a competitive advantage, the resource needs to have certain characteristics. The resource should be (1) valuable, i.e., yield a competitive advantage, (2) rare or scarce, (3) inimitable and (4) non-substitutable (Collis and Montgomery 1995:120; Barney 1991:105; Eisenhardt and Martin 2000:1105). Using such resources, firms can achieve sustainable competitive advantage by implementing value-creating strategies that cannot be easily duplicated by competing firms (Barney 1991:105; Eisenhardt and Martin 2000:1105).

In this research, I have argued that corporate foresight capabilities are a resource in their own right. An implemented corporate foresight system allows a company to discover and exploit arising business opportunities ahead of rivals that lack similar systems. This would qualify corporate foresight as being valuable. In addition, corporate foresight systems are rare, given the lack of successful implementation of corporate foresight systems (Liebl 2005:123; Herzhoff 2004:189). The criterion "inimitable" is not so easy to confirm, but it could be argued that it resides in the

difficulty to implement corporate foresight in different corporate contexts. And the criterion “non-substitutable” could also be affirmed, because the function of corporate foresight is put in place because other mechanisms fail to produce responsiveness and fail to reduce inertia.

Conclusion 11. *Corporate foresight capabilities qualify as a resource with competitive relevance.*

2.4.3 *Dynamic Capabilities*

Based on the criticism that the resource-based view fails to explain how companies gain a competitive advantage in dynamic markets, Teece, Pisano, and Shuen have extended the concept and created the concept of dynamic capabilities. They define dynamic capabilities as:

The firm’s ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments (Teece et al. 1997:516).

Eisenhardt and Martin have taken the concept further, integrating the notion of organizational and strategic routines which the firm uses to reconfigure its resource portfolio. They define dynamic capabilities as:

The firm’s processes that use resources – specifically the processes to integrate, reconfigure, gain and release resources – to match and even create market change. Dynamic capabilities thus are the organizational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve, and die.

Dynamic capabilities thus reflect the ability of an organization to achieve new and innovative forms of competitive advantage. A discontinuous change – the core of the interest of this study – will challenge a company to exercise its dynamic capabilities in order to change and acquire new resources that enhance its ability to compete (Danneels 2008:519). In addition, dynamic capabilities will enable firms to replace capabilities that have become invaluable over time (Helfat and Peteraf 2003:1004; Afuah and Utterback 1997:183; Helfat 2007a; Ambrosini and Bowman 2009:29).

Conclusion 12. *Corporate foresight systems can be regarded as a dynamic capability that enables a firm to detect a need to renew its portfolio of resources.*

2.5 Implications from Past Research for Corporate Foresight

From the literature review on strategic management, innovation management and future research, and relevant management theories, 12 major conclusions have been drawn (see Table 2.11). These conclusions can be used to define the current body of knowledge, identify the research gap, and guide the research design.

Table 2.11 Overview of conclusions from the literature review

Research stream (conclusion no.)	Conclusion for research on corporate foresight
<i>Strategic management perspective</i>	
Environmental scanning (Conclusion 1)	The interpretation of corporate foresight insights should be done at the top management level, and information gathering should be supported by boundary spanners
Corporate change and ambidexterity (Conclusion 2)	In order to ensure long-term survival, companies need to ensure strategic flexibility and build capabilities to detect discontinuous change in their environment
Decision making (Conclusion 3)	To ensure that corporate foresight has an impact, insights should be communicated on many levels simultaneously, and decision makers should participate in the corporate foresight activity
<i>Innovation management perspective</i>	
Radical innovations (Conclusion 4)	Committed individuals are crucial to radical innovations; they should be used for vision building, and they should be integrated into corporate foresight activities
Disruptions (Conclusion 5)	Large incumbent companies tend to be slow and ignorant and need to build dedicated structures for detecting and proactively managing discontinuous change
<i>Future research perspective</i>	
Macro perspective (Conclusion 6)	To make corporate foresight actionable, it should move toward qualitative studies and the active participation of the internal stakeholders
Micro perspective (Conclusion 7)	Successful corporate foresight is built on its actors. Ensure the usage of foresighters with desirable characteristics and traits and the participation of major stakeholders
Micro perspective (Conclusion 8)	There is a need for a common framework for corporate foresight research and coverage of both the foresight manager’s and the foresight customer’s perspective
<i>Management theories</i>	
Contingency theory (Conclusion 9)	The ideal corporate foresight capability mix depends on contextual factors
Contingency theory (Conclusion 10)	The success of best practices depends on contextual factors
Resource-based view (Conclusion 11)	Corporate foresight capabilities qualify as a resource with competitive relevance
Dynamic capabilities (Conclusion 12)	Corporate foresight systems can be regarded as a dynamic capability that enables a firm to detect a need to renew its portfolio of resources

These 12 conclusions can be translated into two basic motivations for building corporate foresight systems, six guidelines for building corporate foresight systems, and the definition of the research gap.

The primary motivation for building corporate foresight systems is derived from the findings on corporate change and on disruptions. The two primary arguments for the need of corporate foresight systems are:

- Large incumbent companies tend to be ignorant and slow to respond to discontinuous change (Conclusion 5).
- Companies need specific systems to detect and manage discontinuous change (Conclusion 2).

In addition, the conclusions can also be used to define guidelines for the design and successful implementation of corporate foresight systems. Six such guidelines can be identified from the conclusions:

- Interpretation of future-related information by top management (Conclusion 1).
- Information gathering by boundary spanners (Conclusion 1).
- Dissemination of foresight insights by participation and multi-level communications (Conclusion 3).
- Use of qualitative data to make participation easier and ensure use and impact of foresight insights (Conclusion 6).
- Focus on choosing the right people as foresighters (Conclusion 7).
- The ideal design of corporate foresight systems depends on contextual factors (Conclusion 9, Conclusion 10).

Conclusion 8 hints at the research gap in the research on corporate foresight. This research gap has two aspects, one methodological and one concerning the content of the research.

The methodological shortcoming is the lack of usage of informants with a customer perspective. Without questioning the internal stakeholder, data on value creation of corporate foresight is subject to a *single informant bias*. This could result in (1) overestimating the impact of corporate foresight and (2) limiting the ability to identify the whole range of benefits created by corporate foresight. Particularly troubling is that in the only research on corporate foresight in which top management and the persons reporting directly to top management were questioned, the top management reported a limited use of foresight insights, and thus a limited impact of corporate foresight (Roll 2004:260). It is therefore important for future research to put the internal customers (or stakeholder) of corporate foresight insights at the center of the empirical investigation.

The content aspect of the research gap is *too narrow a view* of corporate foresight. Research has described corporate foresight either as a set of methods and tools (Porter et al. 2004:287; Schwarz 2009:291; Salo et al. 2003:235; Specht et al. 2003:71) or as a process (Amanatidou and Guy 2008:539; Becker 2002:12; Horton 1999:5; Müller 2008:25; Müller-Stewens and Müller 2009:9). In consequence, it neglected other elements such as actors (foresighters and their internal customers), information sources, and the cultural characteristics of a firm, which may have an important impact on the overall corporate foresight ability of a firm.

Where inductive research has already provided descriptive results, it is generally expected that research should move toward deductive research or toward theory testing. In the case of corporate foresight, the most obvious – and possibly also the most interesting – question for deductive investigation is this: Does corporate foresight contribute to the ability of a firm to survive discontinuous change? As the survival of a company relies on many factors and actions outside corporate foresight systems, empirical investigation would need to control most other variables to obtain sufficient effect strengths.

Another question: Does corporate foresight contribute significantly to the success of an organization? As discussed in more detail in the section on impact and

value contribution (see Sect. 4.1.3), researchers interested in this question would need to further investigate these questions: What are the potential positive impacts of corporate foresight? How can the impact be made operational? What are the elements of corporate foresight capabilities? And how can these elements be made operational?

In addition, there is also the more practical interest in understanding more of the elements of corporate foresight practice for being able to develop them and enhance the ability of an organization to respond to discontinuous change. If the individual element were identified, then it would be vital to obtain a common framework that could be used for both benchmarking and planning the enhancement of corporate foresight abilities.



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