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IS-Based Environmental Scanning Systems: Lessons Learned Based on a Comparative Case Analysis

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List of Abbreviations

ACAP	Absorptive Capacity
API	Areas For Potential Improvements
BI	Business Intelligence
CLI	Composite Leading Indicator
COSO	Committee of Sponsoring Organizations of the Treadway Commission
DCV	Dynamic Capability View
DSR	Design Science Research
DW	Data Warehouse
EBIT	Earnings Before Interest and Taxes
EIS	Executive Information Systems
EVA	Economic Value Added
FT	Financial Times
GDP	Gross Domestic Product
ICT	Information and Communication Technology
IT	Information Technology
IS	Information Systems
KMS	Knowledge Management Systems
KRI	Key Risk Indicators
MSS	Management Support Systems
OECD	Organization for Economic Cooperation and Development
OLAP	Online Analytical Processing
PACAP	Potential Absorptive Capacity
RACAP	Realized Absorptive Capacity
RBV	Resource-based View
RE	Requirements Engineering
ROCE	Return on Capital Employed
SQL	Structured Query Language
VaR	Value at Risk

1. Introduction

The 2008/2009 economic crisis provided a sustainable impulse for focusing earlier on emerging threats and opportunities.[1] But things did not get easier since then. As the volatile summer in 2011 demonstrated, the topic's relevance is still increasing. *Environmental scanning*—ideally, information systems (IS)-based—can help to manage this challenge. Its main function is to gather, interpret and use pertinent information that would assist management in planning the organization's future course of action.[2] Companies that do so will have brighter prospects than those that do not.[3]

1.1 Motivation

In literature a substantial body of knowledge exists, but it often goes *unused* in practice.[4] Moreover, practitioners perceive the task as a difficult one per se.[5] They experience difficulties in design, implementation, and day-to-day operation. Some may not even know how to start.[6] A current survey with executives from companies listed in the FT "Europe 500"[7] report exposed the still evident *missing applicability* of environmental scanning:[8] the executives surveyed considered the body of knowledge to be too complex and too difficult to implement. Therefore, the results of environmental scanning are often *not* a substantial part of executive's decision-making processes.

Environmental scanning is also not just "nice to have," as Kajüter[9] shows in his multicountry comparison. In the wake of several cases of fraud around the turn of the millenium that were neither detected by internal controls nor by auditors, legislators expressed the need for more detailed risk management approaches for example in the U.S. Sarbanes-Oxley-Act. In particular, Section 404 requires companies listed on the New York Stock Exchange to

[1] Cf. Makridakis/Hogarth/Gaba (2010), pp. 83-90, and Hopwood (2009), pp. 797-802.
[2] Cf. Aguilar (1967), p. 1, and Lenz/Engledow (1986), pp. 79-80.
[3] Cf. Ansoff (1980), pp. 131-148.
[4] Cf. Fuld (2003), pp. 20-21.
[5] Cf. Lesca/Caron-Fasan (2008), pp. 371-386.
[6] Cf. Albright (2004), pp. 38-45.
[7] Cf. Mayer (2010), pp. 211-228.
[8] There is a series of empirical evidence for redesign environmental scanning systems. Fuld (2003) showed that 97 percent of US companies lack an early warning system. Interviews with accounting information systems strategists found that two-thirds had been surprised by as many as three high-impact events in the past five years. Day and Schoemaker's (2005) survey of managers found that 81% perceived their need for peripheral vision to be greater than their current capacity.
[9] Cf. Kajüter (2004), pp. 12-24.

establish and maintain an adequate *internal control structure* and procedures for financial reporting. Furthermore, the annual report must contain an assessment of the effectiveness of these control structures and procedures and, in turn, it has to be commented on by the auditors in their report.[10]

The increasing acceptance of information systems among today's executives,[11] and new technological advances of the internet era,[12] make the present moment favorable for redesigning environmental scanning systems. On the one hand, "modern" IS of the internet era cover additional analytical capabilities such as exception reporting, simulations, trend and sensitivity analyses, drill downs and drill-throughs as well as comment and other communication capabilities.[13] Together with new end-user devices it is easier than ever before to access information, even in mobile cases. On the other hand, digital natives, who have grown up in a world where information and communication technology (ICT) is pervasive and ubiquitous, increasingly populate organizations' management along with digital immigrants who learned to engage with IS as adults.[14] As a result, this new-generation executives more naturally accept IS, while also having higher expectations of how these IS should accommodate their preferences.

Challenging the redesign of more applicable environmental scanning systems, this paper addresses the following two research questions which are based on findings from a literature review. First, to give such a redesign a starting point, a set of requirements is developed for evaluating existing and building up new systems. *Requirements* are prerequisites, conditions, or capabilities needed by the users of a software system.[15] Second, by applying these requirements to several cases, design guidelines should be generated that go beyond requirements as they can serve as predefined actions for bringing new-generation environmental scanning systems to life.[16]

[10] Cf. Sherman/Chambers (2009), pp. 163-179.
[11] Cf. Vodanovich/Sundaram/Myers (2010), pp. 711-723.
[12] Cf. Cheung/Babin (2006), pp. 1589-1598.
[13] Cf. Papageorgiou/de Bruyn (2010), pp.58-59, Rainer/Watson (1995), p. 89.
[14] Cf. Vodanovich/Sundaram/Myers (2010), pp. 711-723.
[15] Cf. IEEE (1990), p.64.
[16] Cf. Hoogervorst (2009), pp. 343-396.

1.2 Structure

With the development of a *list of requirements criteria* and the synthesis of *design guidelines* this thesis adheres to design science research (DSR) approach in IS. It aims at developing useful artifacts such as constructs, models, methods, and instantiations that solve relevant design problems in organizations.[17] The proposed set of requirements criteria can be categorized as a *model*, referred to as *evaluation model* in the following. The proposed design guidelines can lead to principles that contribute to *methods* specifying how environmental scanning systems should be designed based on kernel theories.[18]

Various processes exist for developing artifacts under the design science paradigm. Two basic activities are typical for design science; build and evaluate.[19] "Building is the process of constructing an artifact for a specific purpose; evaluation is the process of determining how well the artifact performs".[20] Whereas both activities are performed for the evaluation model, the design guidelines are only a starting point towards a method.

In doing so, this thesis applies the research process of Peffer et al.[21] to the evaluation model. The process consists of six steps and will be explained in the following. In terms of design guidelines, future research will have to start a new research cycle. Figure 1 summarizes the structure of the thesis and illustrates how the sections of this thesis are related to Peffer's DSR process.

Sec. 1 is dedicated to the first step of the DSR process, *identifying the problem and motivating the audience.* In this section lessons learned from the 2008/ 2009 economic crisis are identified and regulatory and business needs explained. Redesigning environmental scanning systems is suggested to help executives focusing earlier on emerging threats and opportunities.

Sec. 2 and **Sec. 3** cover the second step, *defining the objectives of the solution*. After revisiting foundations for environmental scanning systems and IS-based environmental scanning systems these are connected with recent theories in IS design (Sec. 2). After the description of

[17] Cf. March/Smith (1995), p. 255, and Hevner/Chatterjee (2010), p. 55.
[18] Cf. Kuechler/Vaishnavi (2008), pp. 489-504.
[19] Cf. March/Smith (1995), p. 254.
[20] Cf. Ibid., p. 254.
[21] Cf. Peffers/Tuunanen/Gengler/Rossi/Hui/Virtanen/Bragge (2006), pp. 92-98.

the state of the art, research questions and aims for the following sections are specified (Sec. 3).

Sec. 4 then incorporates the third step of *solution design and development*. First, based on the research questions derived in the previous section, this section presents a set of requirements for evaluating and redesigning environmental scanning systems, the *evaluation model*. It is derived from the principle of economic efficiency using findings from the theories mentioned in Sec. 2. Additionally and unrelated to the DSR process, an exemplary solution, which contributes to better integrating environmental scanning results into executives decision making, is presented.

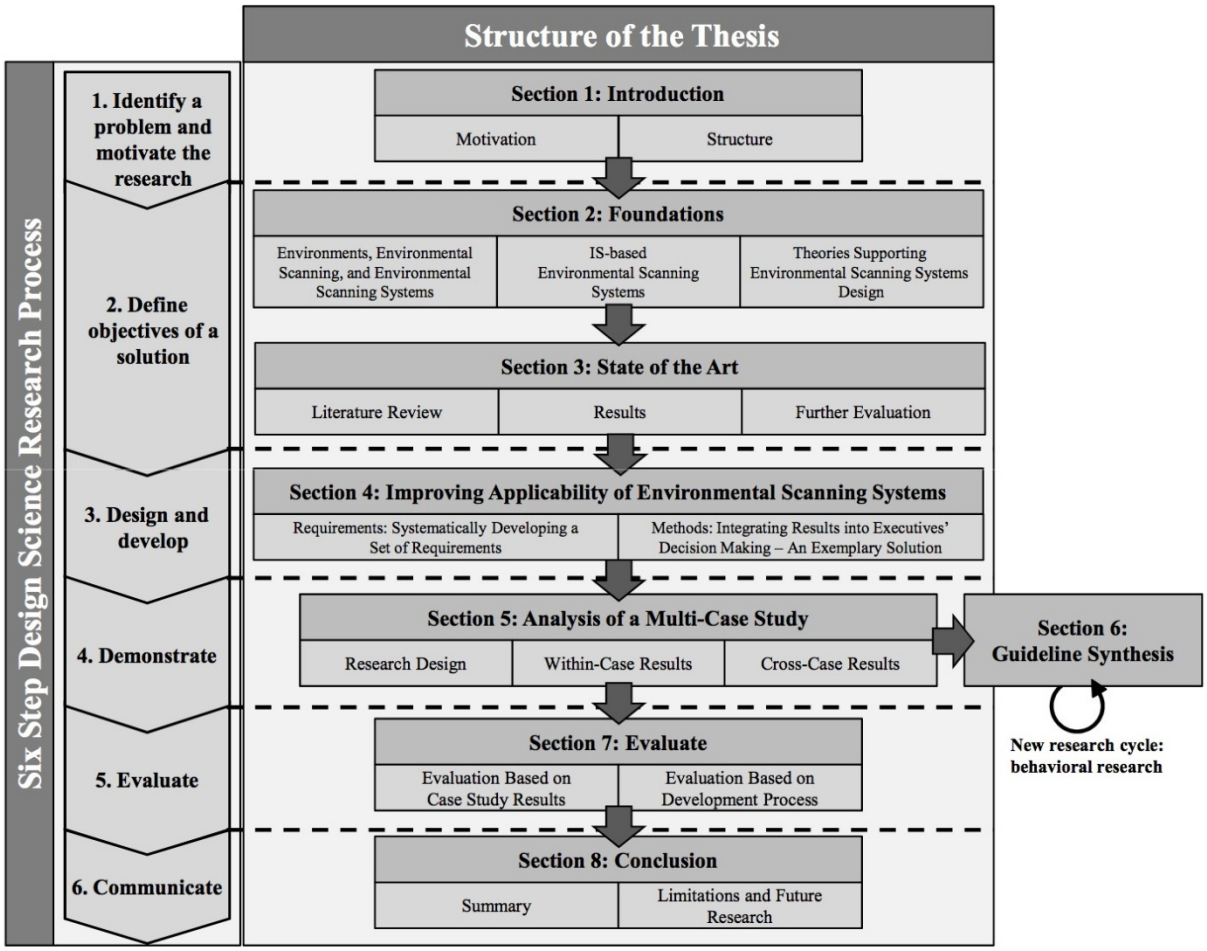

Figure 1: Six step DSR process applied to this thesis

Sec. 5 is concerned with *demonstrating* results and thus it follows the forth step of the DSR process. In this section the multi-case study analysis is described and the results from five large international companies are presented. To accomplish step 4, several environmental

scanning systems give us insights from practice to demonstrate utility of the evaluation model.

Sec. 6 steps out of the DSR process for the evaluation model. *Design guidelines* as the second contribution of this work are synthesized from the results of the multi-case study. This can be seen as a design and development phase of a second research cycle. However, no demonstration or evaluation is performed within this thesis for this artifact.

Sec. 7 then returns to the DSR process and covers the *evaluation* phase. This section presents two different perspectives for evaluating the model; one based on the results of the multi-case studies and the other one based on the development process itself.

Sec. 8 concludes the thesis and the DSR process with *communicating results*. Starting with a summary, this section also shows limitations and outlines possible future avenues of research.

2. Foundations

This section first defines all relevant foundations allowing a clear and comprehensive understanding of the work following. In Sec. 2.1, a first review of the most important definitions will introduce the reader to the field of environmental scanning and IS and will provide a basis for understanding the literature review. Therein, the view on environmental scanning systems as IS-based organizational systems is of special interest. The discipline of requirements engineering (RE) aims at increasing the quality of IS development. For adapting these concepts to the field of environmental scanning systems the basics of requirements engineering are discussed in Sec. 2.2. Last but not least, most current theories in information systems are presented and applied to environmental scanning systems in Sec. 2.3 to give the developed approach a theoretical foundation.

2.1 Environments, Environmental Scanning, and Environmental Scanning Systems

This thesis uses Duncan's definition of a company's environment which is as follows: A company's environment is constituted of the relevant physical and social factors *within* and *beyond* the organization's boundaries.[22]

While operational analysis focuses on (short-term) internal difficulties in the implementation of strategic programs, strategic *environmental scanning* aims at anticipating (long-term) environmental shifts and analyzing their potential impact.[23] This thesis concentrates on the latter, hereafter referred to as *environmental scanning.* As strategic issues can emerge within or outside a company, changes in both a company's external and internal environment are relevant. Thus, internal perspective is included in the definition of a company's environment. Focusing on the process of *environmental scanning,* this thesis will follow Aguilar's[24] definition that outlines its main functions as gathering, interpreting, and using pertinent information about events, trends, and relationships in an organization's environment, which will assist management in planning the future course of action.

Environmental scanning systems have their roots in management literature[25] focusing on the executives' task to be aware of environmental trends.[26] Narchal et al.[27] for example defined these systems as a set of "Radars", a group of managers, who are monitoring the important events in the environment which may create opportunities or threats to the organization. Formality of the scanning approach in an *organizational context* is of great importance to increase information sharing across managers.[28] In the *task perspective* these systems further specify the range of sectors to be scanned and assign responsibility to particular management levels.[29] Concluding task and organizational aspects, *environmental scanning systems* have to specify the sectors to be scanned, monitor the most important indicators of opportunities or threats for the company, cover the IS-based tools to be used, incorporate the findings of such analyses into decision making, and often assign responsibilities for supporting environmental scanning efforts.

[22] Cf. Duncan (1972), p. 314
[23] Cf. Davies/Finlay/McLenaghen/Wilson (2006), pp. 215-246
[24] Cf. Aguilar (1967), p. 1
[25] Cf. Ibid., p. 1
[26] Cf. Narchal/Kittappa/Bhattacharya (1987), pp. 96-105
[27] Cf. Ibid., p. 97
[28] Cf. Yasai-Ardekani/Nystrom (1996), p. 188
[29] Ibid., p. 188

2.2 IS-based Environmental Scanning Systems

According to Silver et al.[30] *information systems* can be seen in a narrow IS-centered view that includes software, hardware, data, people, and procedures and a broader view. Taking the broader view IS are often considered in their interaction with people and business processes and seen in their organizational context. Thus a twofold view on information systems can be condensed, differentiating between its constituency and its organizational context summarized in Fig. 2.

In their paper, Zmud and Benbasat[31] criticize that the information systems discipline suffers too often from under-investigating IT-based artifact of systems and over-investigating too far related topics, treating IT artifacts or IS as a black box. Even though IS discipline involves understanding organizational and individual issues surrounding its use, the IT artifact should still be the central point of interest.

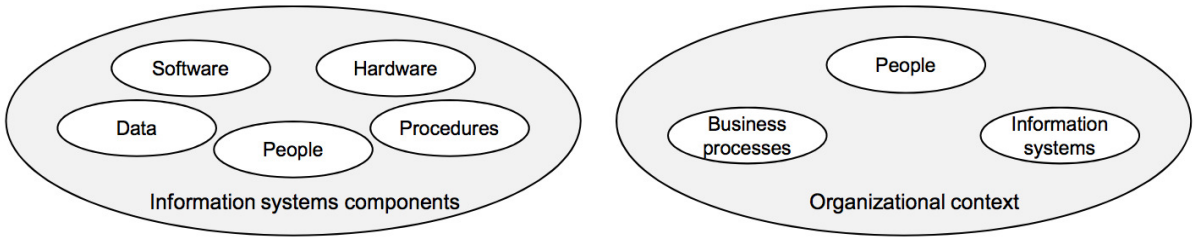

Figure 2: Two different views on information systems[32]

This thesis will concentrate on the broader view that focuses on the interplay between social and technical aspects of IT, which is embedded into a dynamic evolving context.[33] Chatterjee and Hevner also state that frameworks for IS research always include people, (business) organizations, and their existing or planned technology[34] (Figure 2, right half side).

[30] Cf. Silver/Markus/Beath (1995), pp. 362-363
[31] Cf. Benbasat/Zmud (2003), pp. 183-186.
[32] Silver/Markus/Beath (1995), p. 366.
[33] Cf. Agarwal/Lucas (2005), pp. 381-398.
[34] Cf. Hevner/Chatterjee (2010), p. 273.

Information Systems in a Business Context

Information technology (IT)-based IS intended to support managerial actions and decision making are labeled with management support systems (MSS) as an umbrella term.[35] In the following executive information systems (EIS), knowledge management systems (KMS) and business intelligence (BI) as the most important terms for information systems in a business context are shortly presented.

Beginning with *EIS*, these are IT-based IS meant to help top managers as their hands-on, day-to-day information source.[36] As a key characteristic, their overall aim is to help an organization carefully monitor its current status and its progress toward achieving its corporate goals.[37] They should further enable to navigate through information culled from both internal and external databases. Especially environmental information about for example market, technological, competitive, political/legal, economic, and socio- cultural are important.[38] Besides functional requirements, these IS also have to assure that even nontechnical executives should be able to use them.[39]

KMS refers to systems supposed to facilitate creating, gathering, organizing, and disseminating organizational knowledge.[40] As a result of this broad definition, many IS can be subsumed beyond the term KMS. Gluchowski et al. define an *organizing* and *catalyzing* function for KMS. Speaking of the former KMS, have to make specific knowledge available for employees in several value-adding steps. Knowledge management, maintenance, classification, and representation are important aspects for this function. Supporting these processes in which tacit knowledge is generated and disseminated are key components of the latter.[41]

The term *BI* in its origins was mainly affected by companies that used it for marketing purposes. Still no generally accepted definition exists in literature and the variety of possibilities range from a narrow IS-based view on multidimensional data structure to

[35] Cf. Clark Jr/Jones/Armstrong Curtis (2007), p. 579.
[36] Cf. Nord/Nord (1995), p. 95.
[37] Cf. Kelly (1988), pp 77-83.
[38] Cf. Walters/Jiang/Klein (2003), pp. 487-489.
[39] Cf. Houdeshel/Watson (1987), pp. 128-129.
[40] Cf. Alavi/Leidner (1999), p. 3.
[41] Cf. Gluchowski/Gabriel/Dittmar (2008), p. 324.

information systems for analytical and information supply purposes.[42] The definition this thesis will follow is *BI* as a broad category of technologies, applications, and processes for gathering, storing, accessing, and analyzing data to help its users make better decisions[43].

IS-based Environmental Scanning Systems

In general, the term environmental scanning system originally comes from business literature (see above). But even in literature environmental scanning is often allocated in EIS[44], interconnected to BI[45], or integrating KMS[46]. Thus, IS-based environmental scanning systems are organizational systems designed for environmental scanning that are supported by information systems. Their aim is to allow executives to scan their environment from an overall perspective for a proactive corporate management. Taking the IS research view, the term IS-based environmental scanning systems becomes tautological. Even though "system" originally meant "organizational system," it receives a new meaning as this area moves from business research to information systems research. To avoid confusion and for convenience purposes this thesis will simply refer to these as environmental scanning systems though bearing in mind the term's origins.

Requirements for Information Systems

Requirements can be defined as prerequisites, conditions or capabilities needed by users (individuals or systems) to solve a problem or achieve an objective.[47] In computer science, they describe functions and features of IS. The discipline of requirements engineering (RE) aims at increasing the quality of IS development by providing systematic procedures for collecting, structuring, and documenting requirements. These procedures ensure that the requirements are distinct and collectively exhaustive, preventing faulty IS design. Therefore, RE must incorporate the relevant stakeholders and ensure their commitment regarding the

[42] Cf. Gluchowski/Kemper (2006), p. 17.
[43] Wixom/Watson (2010), p. 14.
[44] Cf. Niu/Lu/Zhang (2007b), pp. 510-516, and Ahituv/Zif/Machlin (1998), pp. 201-211.
[45] Cf. March/Hevner (2007), pp. 1031-1043.
[46] Cf. Niu/Lu/Chew/Zhang (2007a), p. 813.
[47] Cf. IEEE (1990), p. 64.

final requirements.[48] From a more formal perspective, RE should help to align the IS design costs and timeline with the required IS functionality.

RE processes consist of three stages.[49] The first phase, *"requirements identification*," focuses on *completeness*. It involves defining the scope of the IS, demarcating the IS from its environment and determining the available sources. Finally, the requirements themselves are collected by analyzing the identified sources using multiple methods (e.g. creativity techniques, literature analysis or empirical methods). The second phase, "*requirement analysis and specification*," focuses on the *distinctiveness* of each requirement. The unstructured requirements are classified first.[50] Overlapping requirements have to be eliminated and the remaining requirements have to be brought into a standard form. Meta languages and models often have an advantage here due to the fact that they are more compact and precise. The focus of the third phase, "*requirements validation*," is twofold and includes *scientific rigor and relevance*. In this phase, decisions are made which requirements to use in subsequent design activities (build, realize, and test).[51] Therefore, each requirement is reviewed for scientific rigor. Consensus then has to be reached by stakeholders about the IS requirements and whether they effectively represent their expectations.[52]

2.3 Theories Supporting Environmental Scanning Systems Design

Environmental scanning systems aim at analyzing and predicting the future to create a sustaining competitive advantage. Therefore, it is their core function to gather and analyze information available inside and outside the companies to achieve competitive advantage as outlined in Sec. 2.1. In literature, a huge body of knowledge about reasoning competitive advantage of a company is available. Starting with the resource-based view (RBV) and dynamic capabilities view (DCV), environmental scanning systems will be located in the absorptive capacity (ACAP) construct.

[48] Cf. Sommerville (2007), pp. 142-145.
[49] Cf. Ibid., pp. 143.
[50] Cf. Ibid., pp. 146-157.
[51] Cf. Ibid., pp. 158-160.
[52] Cf. IEEE (1998), p. iii.

Resource-Based View

Rooting in the Ricardian logic,[53] which simply reasons heterogeneity in performance due to ownership of resources that have differential productivity,[54] the resource-based view (RBV) is a *theoretical framework for understanding strategic management*. It more precisely asserts how competitive advantage within companies is achieved and how that advantage might be sustained over time.[55] In contrast to the Porter[56] Five Forces model that points at industry's structure and company's position as determinants of competitive advantage, RBV focuses on the internal perspective.[57] The fact that there is a significant difference in performance between companies in the same industry and also within narrower groups in the same industry provided some evidence for this assumption.[58] Thus, the effects of idiosyncratic resources can be significant and focusing on the resource perspective of a company can be relevant for determining reasons for competitive advantages.[59]

The term RBV was first introduced by Wernerfelt in 1984. Wernerfelt states that the competitive advantage of a company is dependent on the usage of the bundle of valuable resources at its disposal[60]. The definition of resources is the core of this theory and thus a great variety of definitions exist in literature differing in terms of scope.[61] Following Barney[62], a company's *resources* at a given time consist of assets (tangible or intangible)[63], its organizational processes and routines, and the information and knowledge it controls. The latter can be summarized as *capabilities*, which transform inputs into outputs of greater worth.[64] These resources are tied semi-permanently to the company and are used to choose and implement its strategies.[65] As these competitive advantages should be sustainable,

[53] Cf. Ricardo (1817) in Makadok (2001), p. 388.
[54] Cf. Makadok (2001), p. 388.
[55] Cf. Barney (2001), pp. 41-56.
[56] Cf. Porter (2008), pp. 79-93.
[57] Cf. Eisenhardt/Martin (2000), p. 1105.
[58] Cf. Hansen/Wernerfelt (1989), pp. 399-411.
[59] Cf. Wade/Hulland (2004), p. 110.
[60] Cf. Wernerfelt (1984), pp. 213-225.
[61] Cf. Wade/Hulland (2004), p. 108.
[62] Cf. Barney (1991), p. 101.
[63] Examples for tangible assets are information systems hardware, network infrastructure, and machines. Intangible assets could be software patents and vendor relationships.
[64] Cf. Wade/Hulland (2004), p. 109.
[65] Cf. Barney (2001), pp. 41-56.

resources and capabilities must be valuable, rare, inimitable, and nonsubstitutable (summarized in the VRIN framework).[66]

Although coming from the strategic management and marketing fields, RBV has found implementation in IS research as it provides a framework about the impact of IS on company strategy and performance, guidance on how to differentiate among various types of IS, and a basis for comparing IS and non-IS resources. For a complete introduction of RBV implementations in IS research see Wade and Hulland[67].

Dynamic Capabilities View

The RBV has also been objective to criticism over the past decades. The RBV's inappropriateness for dynamic markets due to its static logic is most important for this purpose. In dynamic markets with rapid and unpredictable changes, RBV cannot adequately explain why companies have competitive advantage[68]. Three dimensions of the environment are mostly contributing to its uncertainty[69]: environmental turbulence (stability-instability), munificence (capacity), and complexity (homogeneity-heterogenity). In contrast to stable environments, different assets and capabilities are needed[70]. These are summarized as *dynamic capabilities* by which managers integrate, build and reconfigure internal and external competencies[71] to address rapidly changing environments.[72]

Whereas the RBV concentrates on a resources-picking mechanism (selecting the *right* resources), thus determining economic profit ex ante and without dependencies, the dynamic capability view (DCV) approach focuses on the building of capabilities and these are affecting economic profit ex post. Since the economic success of dynamic capabilities is dependent on picking the right resources, one can conclude that the DCV follows the RBV and is dependent on it.[73] A company's dynamic capabilities have often been treated as an "elusive Black Box"[74]

[66] Cf. Barney (1991), pp. 106-110.
[67] Cf. Wade/Hulland (2004), pp. 111-142.
[68] Cf. Eisenhardt/Martin (2000), p. 1106.
[69] Cf. Dess/Beard (1984), pp. 52-54.
[70] Cf. Eisenhardt/Martin (2000), pp. 1105-1121.
[71] A *competency* is an organizational routine and can be seen as a cross-functional integration and coordination of capabilities such as MIS capabilities, marketing capabilities, and production capabilities. Competencies that define a firm's fundamental business are defined as core (Hunger/Wheelen (2009), p. 56).
[72] Cf. Teece/Pisano/Shuen (1997), p. 517.
[73] Cf. Makadok (2001), pp. 387-392.

and some have even argued that these are tautologically linked to performance.[75] Two attempts to further understand this concept are noteworthy and enhance understanding.

In defining a set of dynamic capabilities, Teece[76] offers a framework dividing a company's dynamic capabilities in three capacities, namely *to sense, to seize, and to maintain*. The first is a "scanning, creation, learning, and interpretive activity."[77] In order to identify opportunities, organizations must constantly scan, search and explore their environments. But it is not only about identification, it also includes interpretation. Thus, companies need "analytical systems (and individual capacities) to learn and to sense, filter, shape, and calibrate opportunities."[78] The second is the capacity to seize opportunities. It is related to the ability to exploit the sensed opportunities in the first step. It requires selecting development and investments to react and aims at choosing the right path. The third and last capacity, managing threats and transforming, is about the continuous alignment and realignment of specific tangible and intangible assets and aims at bringing plan into action.[79]

Another closely related, recently published framework for increasing measurability of dynamic capabilities is provided by Pavlou and El Sawy[80]. They distinguish four different tools used to reconfigure existing operational capabilities, namely *sensing, learning, integrating, and coordinating capabilities*. Sensing and learning resemble Teece's[81] capacity to sense. Their aim is to gather new market intelligence (sensing) and using this market intelligence to create new knowledge (learning). Integration capability is defined as the ability to combine individual knowledge into the unit's new operational capabilities and lastly coordinating capability is defined as the ability to orchestrate and deploy tasks, resources, and activities in the new operational capabilities.[82]

Both approaches can be seen as closely connected. Teece's *capacities to sense and to seize* and Pavlous and El Sawy's *sensing and learning capabilities* are concerned with observing, scanning, and interpreting the environment and making information usable. Obviously this

[74] Cf. Pavlou/EL Sawy (2011), p. 240.
[75] Cf. Priem/Butler (2001), pp. 27-29.
[76] Cf. Teece (2007), pp. 1319-1350.
[77] Ibid., p. 1322.
[78] Ibid., p. 1327.
[79] Cf. Ibid., pp. 1334-1335.
[80] Cf. Pavlou/EL Sawy (2011), pp. 239-273.
[81] Cf. Teece (2007), pp. 1319-1350.
[82] Cf. Pavlou/EL Sawy (2011), pp. 240-246.

reflects the aim of environmental scanning systems. Besides RBV and DCV, a third approach is to mention next.

Absorptive Capacity Construct

The absorptive capacity (ACAP) construct emerged in organizational research and was introduced by Cohen and Levinthal[83] as the company's ability to recognize the value of new, external information, assimilate it and apply it to commercial ends. As Levinthal and March[84] argue, organizations need to manage a balance between exploratory and exploitative learning. Linking these two forms of learning is transformative learning, in which new knowledge is combined with existing knowledge, allowing the latter to be used in new ways.

Cohen and Levinthal argue that sustaining requires "not only to exploit new, valuable developments, but also to envision better their emergence."[85] Widening this dynamic nature, Zahra and George defined the ACAP construct as a dynamic capability. Thus, the ACAP is embedded in a company's routines and processes, by which companies acquire, assimilate, transform, and exploit knowledge to generate sustainable competitive advantage.[86] They differentiate the process into *potential ACAP* (PACAP), which includes acquiring and assimilating knowledge, and *realized ACAP* (RACAP), including transforming and exploiting knowledge. A well-developed RACAP will increase the probability to achieve competitive advantage, whereas developing the former makes a sustainable competitive advantage more likely.

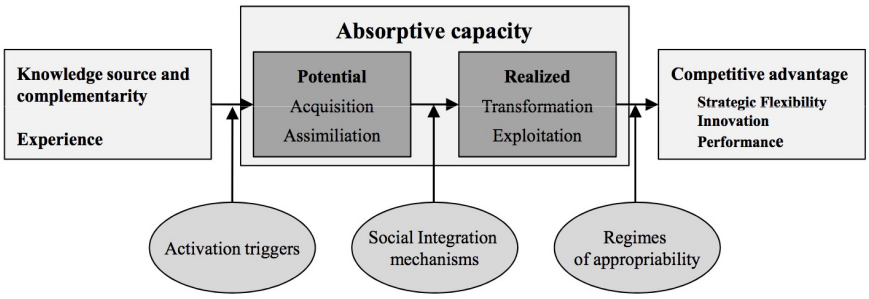

Figure 3: Absorptive capacity in Zahra and George's model[87]

[83] Cf. Cohen/Levinthal (1990), pp. 128-152.
[84] Cf. Levinthal/March (1993), pp. 95-112.
[85] Cf. Cohen/Levinthal (1994), p. 244.
[86] Cf. Zahra/George (2002), p. 188.
[87] Cf. Ibid., p. 192.

Figure 3 summarizes the concept of Zahra and George. They further define antecedents, moderators, and outcomes of ACAP. Antecedents of the system as external sources and knowledge complementarities in combination with experience are suggested to significantly increase the opportunity of a company to develop its PACAP. *Experience* in addition influences especially the locus of search. For example, search areas where past successes occurred will positively influence future acquisition capabilities. *Activation triggers* as moderators are events that encourage or compel a company to respond to specific internal (e.g. product failure) or external stimuli. External triggers could be radical innovations or technological shifts that affect a company's industry. Thus, triggers can influence the locus of search. Sharing the relevant information increases knowledge exploitation. *Social integration mechanisms (formally or informally)* face this problem and contribute to closing the gap between PACAP and RACAP, increasing efficiency. They are useful to exchange ideas, distribute information, gather interpretations and identify trends. Companies that actively promote social integration in their structures are recognized to increase their PACAP.[88]

Further research has been done on additional antecedents of a company's ACAP from which three papers are presented in the following. First, Jansen et al.[89] investigate organizational antecedents based on Zahra and George's approach. They find evidence for cross-functional interfaces (e.g. task forces and teams), participation in decision-making, and job rotation significantly influencing PACAP in a positive manner. For the second dimension (RACAP) they provide formalization and socialization capabilities (e.g. connectedness and socialization tactics) as strengthening antecedents.

Second, Volberda et al.[90] provide a broad summary of *antecedents*. They mention three important classes of antecedents, namely managerial antecedents (combinative capabilities, management cognition, etc.) and intra- and interorganizational antecedents. Additionally, they are first identifying a gap in research on ACAP in terms of taking costs of development into account.

Third, Oh[91] investigates the effects of IT-enabled business intelligence competence and business network structure strength on a company's absorptive capacity. A highly significant contribution for the antecedents of these components is found. Business network structure

[88] Cf. Zahra and George (2002), pp. 193-196.
[89] Cf. Jansen/Van Den Bosch/Volberda (2005), p. 999.
[90] Cf. Volberda/Foss/Lyles (2010), pp. 931-951.
[91] Cf. Oh (2009), pp. 1-13.

strength comprises the network of relationships that allow effective information sharing which can lead to improved sensitiveness to external threats and competition.

Environmental Scanning Systems and the Absorptive Capacity Construct

Environmental scanning systems can be regarded in the context of the ACAP construct. Bearing Zahra and George's dimensions (acquisition, assimilation, transformation, and exploitation capabilities) in mind, a congruency to Aguilar's definition of environmental scanning as gathering, interpreting, and using pertinent information can be determined. Since this solely defines the information support for managerial decisions and excludes putting information into action, it is related to the first three capabilities, excluding exploitation capability. In other words, *environmental scanning systems aim at realizing a company's acquisition, assimilation, and transformation capabilities* (Figure 4).

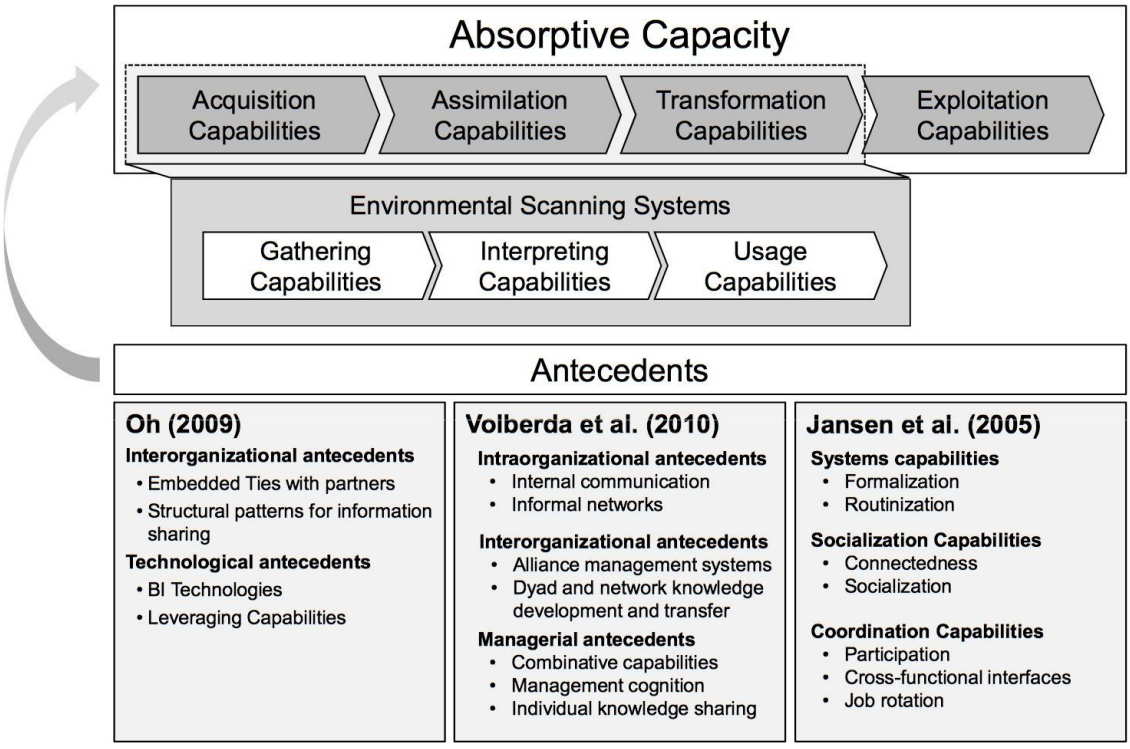

Figure 4: Environmental scanning systems in the context of the ACAP construct

3. State of the Art

In this section Mayer et al.'s[92] literature review for environmental scanning systems will be enlarged and current gaps in literature concerning the applicability of environmental scanning systems identified. In his literature review Mayer lacked the IS support for environmental scanning systems. Concentrating on this aspect this thesis will further extend the review to this domain.

3.1 Literature Review

In accordance with Mayer et al.[93], two dimensions of IS design theories and the research method are used to offer a rigor framework for structuring the literature (Figure 5).

Following Walls et al.[94], three elements can be identified for IS design theories: As argued in Sec. 2.2 *User Requirements* (1) can be defined as prerequisites, conditions, or capabilities needed by users (individuals or systems) to solve a problem or achieve an objective.[95] Further following Mayer,[96] user requirements are differentiated according to their characteristics into a functional (1.1) and a non-functional perspective (1.2).[97] Functional requirements adhere to the purpose of IS and non-functional requirements reflect how well IS perform with the given environment in dimensions such as accuracy, response time, or reliability.[98]

Besides user requirements, IS design theories cover design guidelines for bringing the system to life and thus contribute to models and methods. *Models* (2) outline concrete systems, features, or combinations of these[99] and can be differentiated into forecasting (2.1), indicator-based models (2.2), and environmental scanning systems using weak signals (2.3). *Methods* (3) cover the process of environmental scanning and thus categories are structured according to the definition used in this thesis.

[92] Cf. Mayer/Steinecke/Quick (2011), pp. 207-215.
[93] Cf. Ibid., pp. 207-233.
[94] Cf. Walls/Widmeyer/El Sawy (1992), pp. 36-59.
[95] Cf. IEEE (1990), p. 62.
[96] Cf. Mayer/Steinecke/Quick (2011), p. 215.
[97] Cf. Kotonya/Sommerville (1998), pp. 166-185.
[98] Cf. Paech/Kerkow (2004), pp. 27-40.
[99] Cf. Gregor (2006), pp. 611-642.

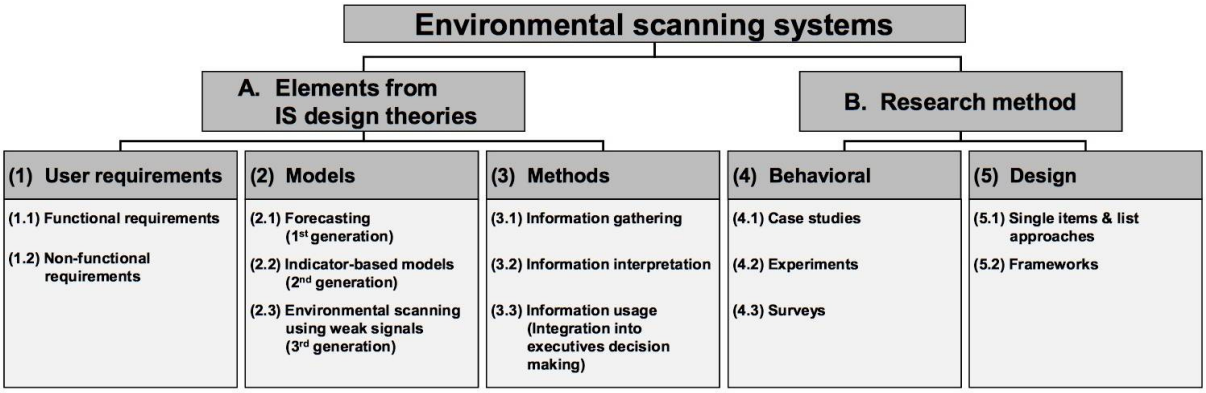

Figure 5: Framework for literature systematization[100]

As a second dimension, the type of research approach is used to systematize the literature. Papers with a *behavioral focus* (4) explain phenomena from practice differentiating between case studies (4.1), experiments (4.2), and surveys (4.3). *Design approaches* (5) involve ideas and frameworks for creating a "better world" and provide more direct recommendations for IS[101]. The two categories are single items and broader "list" approaches that specify sets of requirements (5.1), and frameworks (5.2).

Search Strategy

This thesis generally follows the same approach as Mayer et al.[102] did and thus incorporates vom Brocke et al.'s[103] four-step process: (1) First, using the MIS Journal Ranking,[104] the most important IS journals[105] are selected, reflecting their ranking and impact factor.[106] Furthermore, the research is expanded with proceedings from the two "A"-ranked international conferences: International and European Conference on IS (ICIS, ECIS). (2). In order to access the journals, a database search is the second step. This work used EBSCOhost, Google scholar, Science Direct, and Wiley InterScience. (3) Third, the sources are searched via different keywords. Mayer et al.[107] used the keywords "environmental scanning system" and the terms "early warning system, weak signal, leading indicator" which produced

[100] Cf. Mayer/Steinecke/Quick (2011), p. 212
[101] Cf. Walls/Widmeyer/El Sawy (1992), pp. 36-59.
[102] Cf. Mayer/Steinecke/Quick (2011), pp. 207-233.
[103] Cf. vom Brocke/Simons/Niehaves/Riemer/Plattfaut/Cleven (2009), pp. 2215-2216.
[104] Cf. AIS (2010).
[105] MIS Quarterly, Decision Support Systems, Information & Management, Journal of Management Information Systems, European Journal of Information Systems, and Information System Management.
[106] Cf. Webster/Watson (2002), pp. 13-23.
[107] Cf. Mayer/Steinecke/Quick (2011), p. 216.

14 relevant hits in total. (4) Fourth, by doing a backward and forward search, Mayer et al.[108] did some search on strategic management literature[109] coming up with another 53 hits and completed the literature search with related work from the area of MSS, leading a total of 85 relevant publications.

As this previous research only included the MSS area, in the last step this thesis revisits step (3) and (4), incorporating additional keywords from the area of MSS[110] and including the strategic management literature in the first round as well. The review resulted in 20 relevant publications in step (3) and additional six through a forward and backwards search (for further details see table A1 in the appendix A). Table 1 summarizes the search string used by Mayer et al. and the one used in this thesis.

<table>
<tr><td colspan="2"></td><td colspan="8">OR</td></tr>
<tr><td></td><td></td><td colspan="8">Environmental scanning systems</td></tr>
<tr><td>AND (Mayer et al. 2011)</td><td>Expert focus</td><td colspan="2">Early warning system</td><td colspan="3">Weak signal</td><td colspan="2">Leading indicator</td></tr>
<tr><td>AND (review on hand)</td><td>System focus</td><td>Management support systems</td><td>Executive information systems</td><td>Decision support systems</td><td>Knowledge management system</td><td>Business intelligence</td><td>Information systems</td><td>Information technology</td></tr>
</table>

Table 1: Search string for literature review

3.2 Results

Figure 6 presents the 111 publications within the framework presented in Sec. 3.1. The most revealing publications are discussed below. As the focus of this thesis is on IS design, this thesis concentrates on user requirements, models, and methods (Figure 6, left half side). After reviewing the results, three current gaps for increasing applicability of environmental scanning systems are identified.

[108] Cf. Ibid., pp. 207-233.
[109] Strategic Management Journal, Long Range Planning, Journal of Management Studies, Technology Analysis and Strategic Management, Academy of Management Review, Harvard Business Review.
[110] The terms in use were: Management Support Systems, Business Intelligence, Decision Support Systems, Executive Information Systems, Information Systems, and Information Technology as well as their abbreviations.

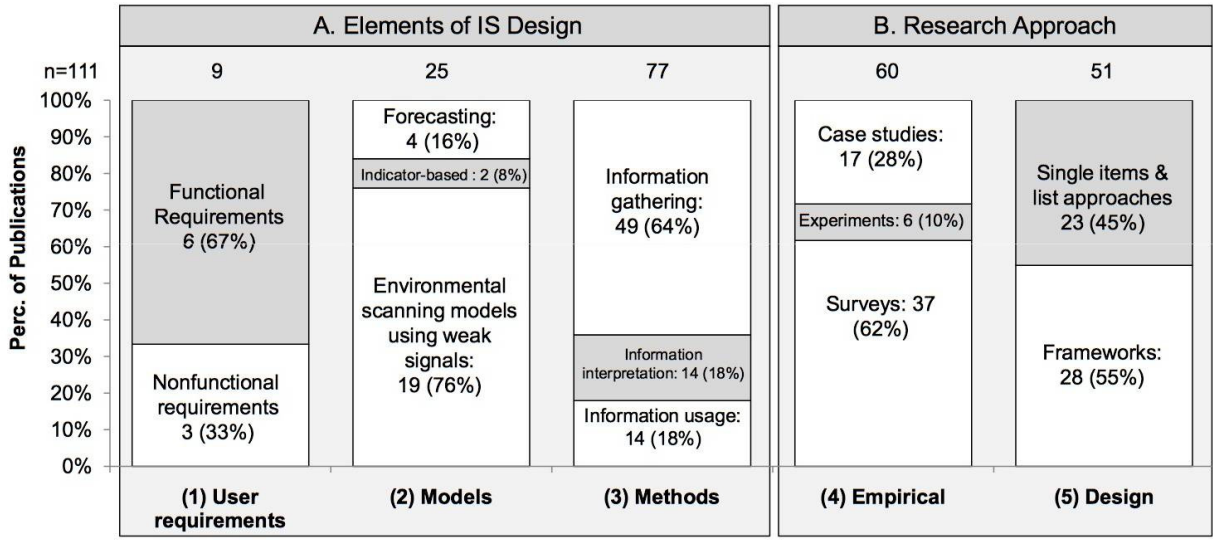

Figure 6: Classification of the publications[111]

(1) User requirements: Only nine out of 111 publications focus on either functional or non-functional requirements. Yasai-Ardenaki & Nystrom[112] as a prime example for functional requirements, stipulate a link between scanning areas and strategy. Others require scanning areas at least to cover science, politics, law and justice and international relationships.[113] Non-functional requirements on the other side often concentrate on scanning frequency, formalization and IT support.[114]

(2) Models: As the additional keywords did not hit any new publications, still 25 out of 111 publications cover models for environmental scanning systems. Early warning systems as key-figure-oriented approaches are based on thresholds. These define the range of tolerance which triggers an alert, if a critical value is exceeded. Forecasting advances this technique. It uses time series, not only for planned and actual data, but also planned and extrapolated as-is data building up the models of the first generation. For the second generation of models an exemplary model can be found in Davies et al.[115] They propose Key Risk Indicators (KRI) as standardized indicators that focus on potential problems. As for the first generation reference values and ranges of tolerance to avoid overreactions are suggested. Ansoff first introduced the concept of weak signals in 1975.[116] A real world example of weak signals and the difficulty of their identification can be found in the emergence of political turmoil such as of

[111] Based on Mayer (2011), p. 279.
[112] Cf. Yasai-Ardekani/Nystrom (1996), pp. 187-204.
[113] Cf. Daft/Sormunen/Parks (1988), pp. 123-139.
[114] Cf. Ahituv/Zif/Machlin (1998), pp. 201-211.
[115] Cf. Davies/Finlay/McLenaghen/Wilson (2006), pp. 215-246.
[116] Cf. Ansoff (1975), pp. 21-33.

the populist leader Hugo Chavez. It was considered an "irrational" scenario that Chavez could take on the establishment, declare material law, and nationalize the Petróleos de Venezuela SA oil company on a Sunday afternoon. As Day and Shoemaker[117] point out, early warning signals of pending turmoil are visible if scenarios are considered not unthinkable. As they are rather difficult to identify and interpret, they often lack "grasp" for direct interactions. Ansoff's concept still is topical in recent literature. In fact, 76% of publications about models use his approach.

(3) Methods: Starting with Aguilar[118] four different modes of scanning in 1967, namely undirected viewing, conditional viewing, informal search, and formal search, a lot of research has been conducted since then, especially concerning the *information gathering* process. Attaining strategic advantages by superior information gathering has been of high interest as it is the starting point for all interpretation and usage activities. Thus, unsurprisingly 64% of all publications on methods are mainly concerned with information gathering. As a prime example, Pant and Sheng[119] concentrate on competitor identification and present a systematic study of *various web metrics that may contain relevant cues for automated gathering*. In addition to competitor identification, many other scanning areas have been in focus to facilitate the process of information gathering. Wei and Lee[120] propose an event detection technique that identifies the onset of new events from streams of news stories. Besides these two internet-based examples, also *capital markets* provide useful information on customers, suppliers, competitors, and the economic development.[121] They can deliver future perspectives, e.g. on growth rates of economies or net sales of organizations. Gleißner and Füser[122] propose artificial neural networks to support early warning capabilities in corporations. In contrast to humans, they are not limited by psychological barriers. Moreover, they can deal with many different variables coincidentally—as needed to handle the potential span of weak signals. In terms of IS support, Goul and Corral[123] further ask for *data warehouses* (DW) to include information about external issues such as competitors or regulations and to provide measurability of the strategic advantages. Finally, bearing in mind

[117] Cf. Day/Schoemaker (2005), p. 148.
[118] Cf. Aguilar (1967), p. 1.
[119] Cf. Pant/Sheng (2009), pp. 1-13
[120] Cf. Wei/Lee (2004), pp. 386-401.
[121] Cf. Plambeck/Weber (2010), pp. 689-710.
[122] Cf. Gleißner/Füser (2000), pp. 933-941.
[123] Cf. Goul/Corral (2005), pp. 915-932.

the upcoming information overload, Cecchini et al.[124] propose *semantic search as a predictor of upcoming event*. Recent developments in the world wide web contributed to environmental scanning by incorporating *social networking* to provide useful information on customers and competitors.[125]

Several research has been done concerning *interpretation capabilities* but still underrepresented compared to information gathering. Thus, literature on this topic covers 18% of the publications researched: mathematical methods facilitate a systematic integration of quantifiable figures into environmental scanning systems. March and Hevner[126] suggest computational *methods such as data mining, genetic algorithms, neural networks, and case-based reasoning* to conceptualize the collected data with respect to business tasks. But, besides this mathematical and technical perspective, the 2008/2009 economic crisis showed that they significantly lacked understanding of the users. Often premises were too complicated[127] or the use of confidence intervals in value-at-risk models excludes improbable, high-impact events.[128] Taleb et al.[129] also criticize these models, because even small errors in the assumptions underlying the distributions can be devastating. *Heuristic approaches* are alternatives.[130] For example, the delphi method comprises three features.[131] Narchal et al.[132] recommend influence diagrams focusing on levers and their influence on the most important environmental indicators. In order to model dependencies between single items, cross-impact matrices evolved.[133] It is also argued that such matrices can contribute to finding most probable scenario of the future. Besides mathematical models and heuristics, research also points at humans capabilities as an important factor in interpreting information. Based on Endsley's[134] situation awareness model Niu et al.[135] propose a framework for executive support systems that takes human's *cognitive orientation into account*. Besides pure data analysis of environmental information, a thinking support is suggested that consists of explicit

[124] Cf. Cecchini/Aytug/Koehler/Pathak (2010), pp. 164-175.
[125] Cf. Chen/Chau/Li (2011), pp. 649-650.
[126] Cf. March/Hevner (2007), pp.1031-1043.
[127] Cf. Makridakis/Hogarth/Gaba (2010), pp. 83-90.
[128] Cf. Fuld (2003), pp. 21-22.
[129] Cf. Taleb/Goldstein/Spitznagel (2009), pp. 78-81.
[130] Cf. Ansoff (1980), pp. 131-148.
[131] Cf. Dalkey (1969), pp. 15-17.
[132] Cf. Narchal/Kittappa/Bhattacharya (1987), pp. 96-105.
[133] Cf. Fontela (1976) , pp. 29-33.
[134] Cf. Endsley (1995), pp. 32-64.
[135] Cf. Niu/Lu/Zhang (2007b), pp. 512-514.

and tacit knowledge data bases. Heinrichs[136] goes even further in saying that web-based software tools can prove to be counterproductive when the basic understanding of the business models and thus the mental model is missing.

The field of *information usage* is underrepresented compared to the field of information gathering. Only 18% of the identified articles focused on this part. However, the importance of this field is recognized. Fuld[137] showed that companies often fail to act on generated environmental scanning information, either by misjudge the impact of identified opportunities and threats on (financial) performance indicators or not incorporating the results of environmental scanning systems in executives' decision making process per se. Frolick et al.[138] argue to embed EIS into the environmental scanning process at different stages as EIS can enhance identifying issues, establishing means of scanning, delineating sources of external information and decision making. Finally, they can help to incorporate anticipated changes in the planning and reporting. Modern EIS, however, are often redesigned to hypermedia style in order to provide standard web browsers as the user interface. But experiments have shown that the use of multimedia in a hypermedia EIS used for environmental scanning can have a negative influence on performance.[139] Besides the platform, information usage is also influenced by the type of presentation. Using IT-based *value-driver trees*,[140] as a highly aggregated presentation of value at risk (VaR),[141] should contribute to enhance environmental scanning.

Research Gaps

This literature systematization reveals three major gaps for more applicable environmental scanning systems existing in literature.

First, in terms of user requirements the literature review revealed a *lack of sound requirements analysis*. Out of 111 relevant publications, just 9 examine requirements (Figure 6): Most of them, such as Frolick et al.,[142] follow just simple list approaches without a superordinate

[136] Cf. Heinrichs/Lim (2003), pp. 103-112.
[137] Cf. Fuld (2003), pp. 21-23.
[138] Cf. Frolick/Parzinger/Rainer/Ramarapu (1997), pp. 35-40.
[139] Cf. Huang (2003), pp. 189-198.
[140] Cf. Mayer (2011), p. 284.
[141] Cf. Chen/Chau/Li (2011), pp. 649-650.
[142] Cf. Frolick/Parzinger/Rainer/Ramarapu (1997), pp. 35-40.

system. Other approaches are as diverse as the requirements they provide, and none apply a systematic process for developing requirements criteria.

Second, in terms of models, weak signals *lack the "grasp" to apply in practice*. They are the most popular approach in literature to find anticipating indicators. The main problem with these is to separate them from day-to-day vibrations without consequences and to incorporate them into decision making.

Third, in the field of methods it can be concluded that besides a sound work on information gathering, approaches *lack to provide solid information interpretation and to closer incorporate environmental scanning results into executives' decision making*.

This thesis will contribute to more applicable environmental scanning systems by tackling the first and the third gap in the following. Starting with the first gap, this thesis will further evaluate the different approaches to requirements lists with respect to their development process.

3.3 Further Evaluation

As the literature review in Sec. 3.2 revealed, just six out of 111 publications focus on functional requirements and an even minor number of three publications on non-functional ones (Figure 6). In addition to these nine, three publications were included, which designed systems and thus indirectly determined requirements.

Going into more detail about the development process of these requirements list approaches, two different types of list approaches are differentiated: Model-free lists of requirements and model-related lists of requirements. In comparison to other domains of IS research, any example of a more complex structural approach for defining requirements, such as the Technology Acceptance Model,[143] could be identified. This may be due to the fact that environmental scanning is often subsumed in EIS and thus has not been subject to much individual research itself.

[143] Cf. Davis (1989), pp. 318-340

Model-Free Lists of Requirements

Model-free lists of requirements are characterized by an *unsystematic collection of requirements*. Frolick et al.[144] use a list approach by mentioning several requirements without any meta structure. An exemplary requirement is the integration of external and internal sources that contribute hard and soft data about the environment. Other authors derive their requirements solely from literature,[145] best practices, or own experience. These approaches most often do not make use of a meta structure principle or second-level structuring dimensions.

Model-free lists of requirements most often cover few variables whereas others cover many variables. The left hand side of Figure 7 summarizes researched examples of requirement lists for environmental scanning systems. Most of them do not specify why certain requirements or dimensions are included. The desire to be relevant for practice dominates scientific rigor.

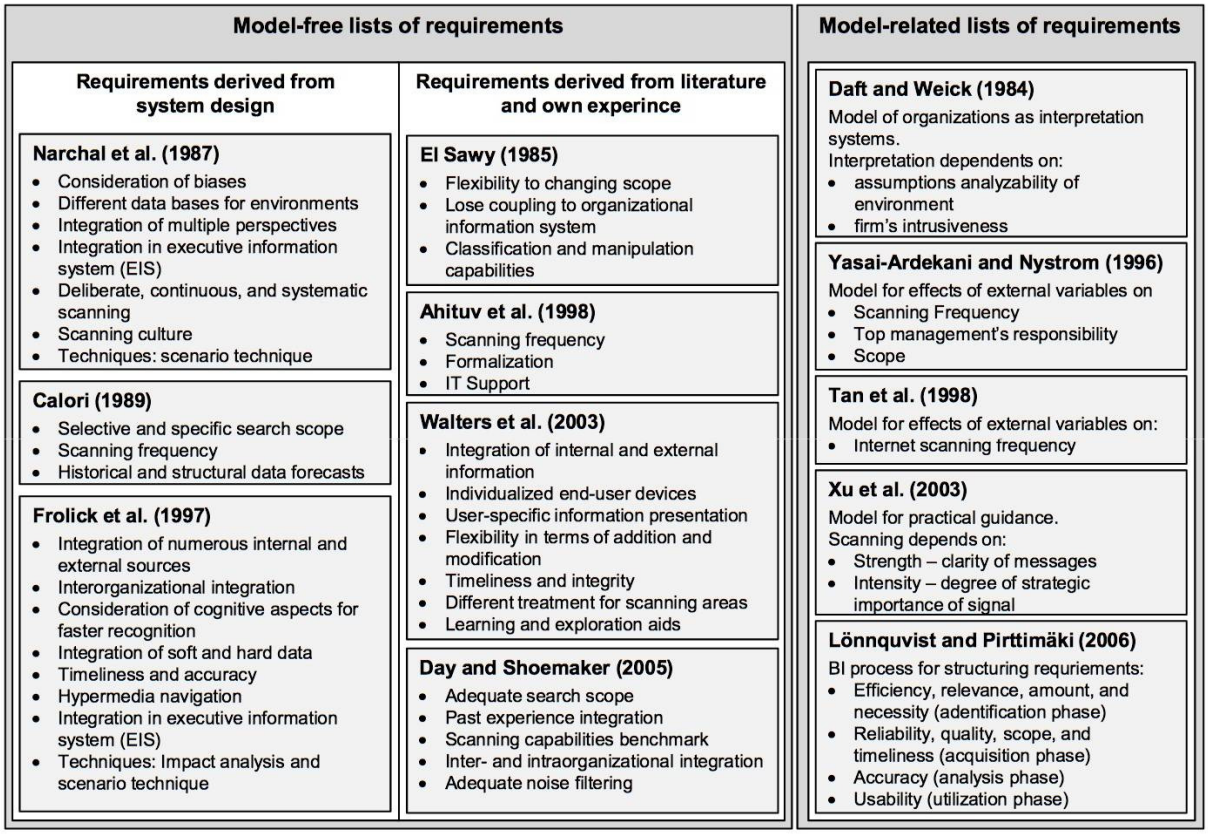

Figure 7: Examples from literature for model-free and model-related list of requirements

[144] Cf. Frolick/Parzinger/Rainer/Ramarapu (1997), pp. 35-40
[145] Cf. Walters/Jiang/Klein (2003), pp. 487-495

Model-Related Lists of Requirements

Model-related lists of requirements build or use *models to contextualize requirements*. They either focus on few requirements and explain how they have to adjust to dependent variables such as environmental volatility[146] or they define models for direct practical guidance. As an example of the latter, Xu et al.[147] provide a model to explain requirements in terms of strength (clarity of the message) and intensity (degree of strategic importance) of a signal.

Model-related lists of requirements focus on putting requirements such as scanning frequency into context and thus concentrate on a few aspects of environmental scanning only. They make use of a superordinate classification. For example, Lönnquvist and Pirttimäki[148] structure requirements according to a BI process consisting of the four phases.[149] Approaches are summarized in Figure 7 (right hand side).

Gap analysis

DSR focuses on accomplishing utility. This section evaluates model-free and model-related lists of requirements with RE criteria from Sec. 2.2. The results are summarized in Figure 8, using a 5-point rating scale.

Model-free lists of requirements cover different numbers of variables, randomly derived from literature or solely based on the authors' experience or best practice. As the *completeness* of this method is questionable, a weak assessment ("bad") is justified. Model-related lists of requirements, in general,[150] put even fewer requirements into context and thus provide even less completeness. In terms of *distinctiveness*, the model-free lists of requirements lack a method for structuring classification. Thus they are rated "bad". Model-related lists of requirements are much more focused and provide a superordinate classification ("good").

[146] Cf. Tan/Teo/Tan/Wei (1998), pp. 76-87 or Yasai-Ardekani/Nystrom (1996), pp. 187-204.
[147] Cf. Xu/Kaye/Duan (2003), pp. 381-389.
[148] Cf. Lönnqvist/Pirttimäki (2006), pp. 32-40.
[149] The BI-process consists of the four phases: identification of information needs, information acquisition, information analysis, and storage and information utilization
[150] Lönnqvist/Pirttimäki (2006) is an exception as it uses a process-oriented model which is more likely to take a broad perspective and thus should achieve a "good" level of completeness

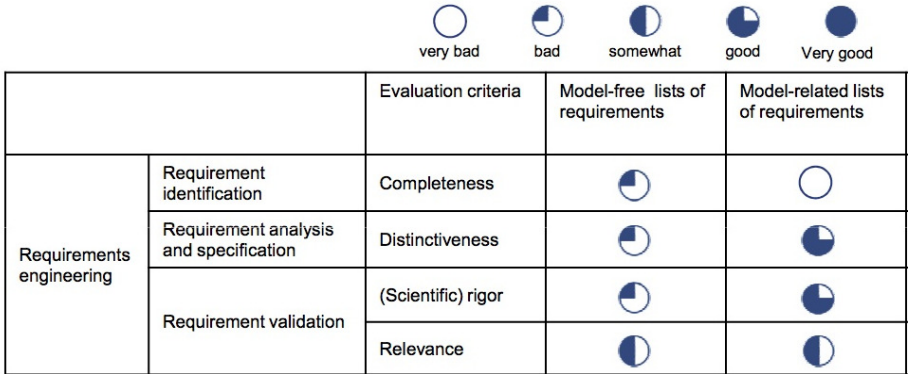

Figure 8: Evaluating the two list approaches in literature

More interesting are the differences regarding *(scientific) rigor*. The model-free lists of requirements are based on literature research and criteria are selected on the authors' experience. Therefore, they are rated "bad". Model-related lists of requirements are based on either empirical evidence or are derived from literature. Since they are focused on few requirements, the model derivation is rigor, thus the rating is "good". No easy way exists to judge the *relevance* of the list of requirements definition approaches. Bearing in mind the fact that truly applicable approaches exist, both receive an average rating ("somewhat").

In summary, both kinds of lists of requirements are applied in practice thanks to their clear information and system antecedents and their ease of use. However, such approaches are assessed negatively in terms of requirement completeness and, more obviously, (scientific) rigor. A promising solution would therefore be to develop a method that incorporates a more rigorous approach without losing relevance. The result should be an applicable list approach to requirements criteria for environmental scanning systems. These criteria have to be derived in a more rigorous and transparent way than done in the mentioned model-free list approaches.

4. Improving Applicability of Environmental Scanning Systems

In this section solutions are provided to tackle the gaps identified in Sec.3.2. A systematic approach to requirements criteria is derived first in Sec. 4.1, while Sec. 4.2 will present an exemplary solution to integrate environmental scanning results into executives' decision making.

4.1 Requirements: Systematically Developing a Set of Requirements

The model development in the following follows Popper's approach[151] of deduction to define a systematic list of requirements criteria for environmental scanning systems.

4.1.1 Principle of Economic Efficiency

The principle of economic efficiency, which focuses on the ratio of cost and benefit, is a generally accepted paradigm in business research[152] and IS research[153]. It thus should serve as a good starting point for the model.

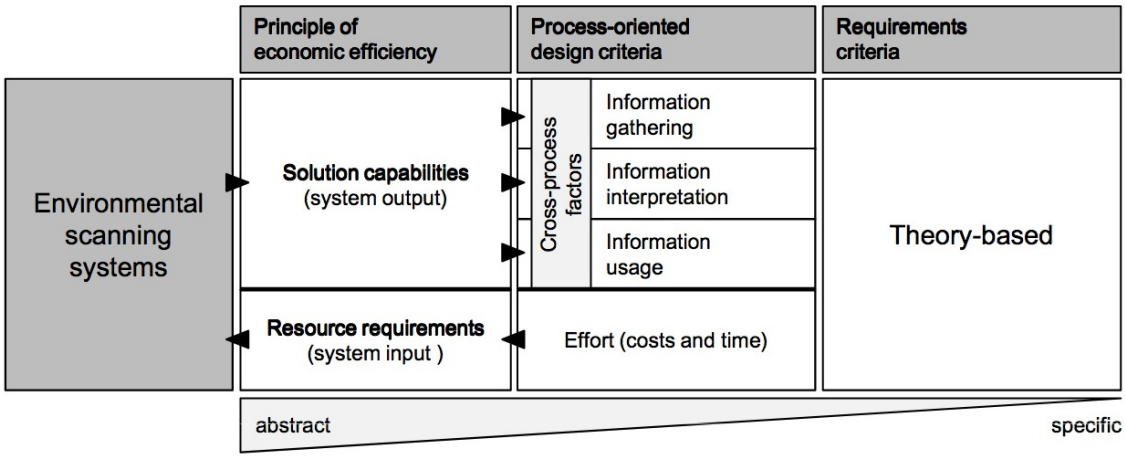

Figure 9: Approach to systematically develop a list of requirements

Even though the cost of IS design can be identified, quantifying the profitability of delivered information is limited. To provide surrogates, express economic efficiency is expressed in a system of basic criteria (Figure 9). Following the "black box" method from mechanical engineering, these criteria can be differentiated into *solution capabilities* and *resource requirements*. Solution capabilities cover how IS output supports environmental scanning for managers. The resource requirements, in turn, cover the input needed to generate the output.

[151] Cf. Popper (2005), pp. 264-267.
[152] Cf. Samuelson (1983), pp. 21-28.
[153] Cf. Stair/Reynolds (2011), p. 67, propose three steps that business has passed through in the use of information systems: cost reduction and productivity improvement, gaining competitive advantage, and the recent shift from strategic management to performance-based management considering both costs and benefits.

4.1.2 First Level of Specification: Design Criteria

Following Aguilar's[154] process-oriented view, environmental scanning *gathers, interprets, and uses relevant information* about events, trends, and relationships in an organization's environment to assist management in planning the future course of action. Thus, this research starts specifying solution capabilities for environmental scanning systems with information gathering, interpretation and usage capabilities. In addition, *cross-process factors* that contribute to capabilities not subsumed by the previous categories are suggested to enhance completeness (Figure 9). Resource requirements can be measured in terms of the *effort* to set up the environmental scanning system.

4.1.3 Second Level of Specification: Requirements Criteria

The outlined design criteria are rather abstract. With respect to Aguilar's[155] definition, environmental scanning systems contribute to a company's ACAP as described in Sec. 2.3. Thus, research is examined based on this theory to define requirements criteria. Final list of requirements is summarized in Figure 10.

Zahra and George[156] state three attributes of *information gathering*: direction, intensity, speed. To the first, the COSO II framework is applied.[157] In doing so, a first objective for environmental scanning systems is to gather information concerning the company's vision and strategic program (mission). Because their direction is high-level and long term, associated risks are named strategic ones (R1). Environmental scanning systems also have to incorporate a more short-term perspective. Regarding the definition (Sec. 2.1), this thesis focuses on the most important operational risks relevant for management purposes. The scanning area is most often the company's internal and external value chain (R2).[158] Furthermore, environmental scanning systems should focus on gathering information for "regulatory compliance" (R3). In addition to the most important risks, information gathering must take chances into account.[159] As the ratio has to be balanced, a company-specific chance-risk-ratio is suggested (R4). Four criteria specifying the direction of information gathering for

[154] Cf. Aguilar (1967), p.1.
[155] Cf. Ibid., p.1.
[156] Cf. Zahra/George (2002), p. 189.
[157] Cf. Committee of Sponsoring Organizations of the Treadway Commission (COSO) (2004), p. 9.
[158] Cf. Mayer/Marx (2010), p. 517.
[159] Cf. Teece (2007), p. 1321.

environmental scanning systems are the result: coverage of three types of risks (R1-R3) plus chances (R4).

Principle of economic efficiency	Design criteria	Requirements criteria		Description
Solution capabilities (system output)	Information gathering	R1	Coverage of strategic risks (vision and strategic program)	To what degree does the environmental scanning system include information concerning strategic risks?
		R2	Coverage of operational risks (internal and external value chain)	To what degree does the environmental scanning system include information concerning operational risks?
		R3	Coverage of information for "regulatory compliance"	To what degree does the environmental scanning system include information concerning regulatory compliance?
		R4	Consideration of chances (adhering company-specific chance/risk ratio)	To what degree does the environmental scanning system take account of monitoring opportunities?
		R5	IS support: intensity and speed for information gathering	Does the environmental scanning system use modern IT to increase speed and intensity of information gathering?
	Information interpretation	R6	Bias prevention	To what extent does the system provide methods or other functionalities to prevent biased interpretation?
		R7	Level of knowledge and thinking process support	To what extent does the environmental scanning system provide explicit and tacit knowledge for interpretation?
		R8	IS support: range of information interpretation	To what extent does the system provide advanced functions for technical analysis? (e.g. data mining)
	Information usage	R9	Quality of information presentation	To what extent is the interface design user-friendly and provide graphical or aggregated forms of presentation?
		R10	User interface and dialog control	To what extent is the dialogue control of the current system comfortable and user-friendly?
		R11	Communication functionalities	To what extent does the system support advanced communication functionalities (internal and external)?
		R12	IS support: ease of IS handling for information usage	How does the system increase the ease of using information gathered and interpreted before?
	Cross-process factors	R13	Timeliness	How frequently is the data basis of the current system updated?
		R14	Flexibility	How flexible (agile) is the current environmental scanning system to meet changing requirements itself?
		R15	Accuracy	How accurate is the information provided by the current environmental scanning system?
		R16	Consistency	How important is the system's reliability in terms of avoiding manipulation, disruptions, and mechanical failures?
		R17	Level of interorganizational integration	To what extent are external partners (supplier, customer, R&D partner or others) integrated in the system?
		R18	IS support: IS transparency for cross-process factors	To what extent are automatic validation checks incorporated?
Resource requirements (system input)	Effort	R19	Cost adequacy	What did the current environmental scanning system cost?
		R20	Time adequacy	How much time has been invested so far in developing the current environmental scanning system?

Figure 10: List approach to requirements criteria (evaluation model)

Focusing on the *intensity and speed* of information gathering, Oh[160] finds evidence that leveraging "modern" IS capabilities,[161] or collaboration techniques,[162] or just BI with a central data warehouse (DW), significantly enhances a company's process of information gathering.[163] But even more sophisticated methods, such as the automated technique proposed

[160] Cf. Oh (2009), pp. 3-5.
[161] Examples are data mining, semantic search, and artificial neural networks.
[162] Examples are RSS feeds, customer feedback on social media, professional databases (Elofson/Konsynski (1991), pp.37-62).
[163] Cf. March/Hevner (2007), p. 1041 and Oh (2009), pp. 3-5.

by Pant and Sheng[164] for competitor identification using the most significant web-based cues and predictive modeling, are noteworthy. This perspective can be summarized as "IS support: intensity and speed for information gathering" (R5).

Information interpretation covers the ability of IS to analyze and transform gathered information[165]. Bearing in mind the concepts of Kahnemann and Lovallo[166] about biased human behavior, information interpretation capabilities of IS must take biased human cognition into account. In this sense executives are most often susceptible to two isolation errors, or biases. First forecasts of future outcomes tend to be anchored on plans and scenarios of success rather than on past results and thus be considered too optimistic (bold forecasts). Second the evaluation of single risky prospect neglect the possibilities of pooling risks (timid choices).[167] Obviously these biases lead to deviations from rational behavior and thus could result in additional costs for the company. Adopting techniques to overcome these decision biases can create competitive advantage.[168] Some techniques can be found in literature. Kahnemann and Lovallo[169] propose adopting an outside view, that means treating the problem as an instance of a broader category in contrast to a unique problem, as a general possibility to reduce the biases. Plambeck and Weber[170] mention that the propensity of executives to see issues in an ambivalent light can be increased through interventions aimed at organizational processes and cultures. Jansen et al.[171] suggests involving more people in decision making, having subordinates take part in higher-level decisions, and cross-functional interfaces as mechanisms.[172] This can all be summarized as bias prevention (R6) of the information system in use.

Focusing further on human's bounded rationality,[173] researchers point to attention as the scarce resource in real world decision making. Following Lipschitz et al. [174,] these problems can be characterized by time pressure, uncertainty, ill-defined goals, high personal stakes, and

[164] Cf. Pant/Sheng ibid., pp. 1-13.
[165] Cf. Zahra/George (2002), pp. 189-192.
[166] Cf. Kahnemann/Lovallo (1993), pp. 17-31.
[167] Cf. Ibid., p. 17.
[168] Cf. Teece (2007), p. 1329.
[169] Cf. Kahnemann/Lovallo (1993), p. 30.
[170] Cf. Plambeck/Weber (2010), p. 705.
[171] Cf. Jansen/Van Den Bosch/Volberda (2005), pp. 1001-1002.
[172] Kahnemann/Lovallo (1993) contradict this proposition as they suggest decision makers to become more risk averse when they expect their choices to be reviewed by others, p. 22.
[173] Cf. Simon (1978), pp. 1-16.
[174] Cf. Lipschitz/Klein/Orasanu/Salas (2001), p. 333.

other complexities. In these environments a systematic deviation from rational choice models can be identified.[175] Lipschitz et al.[176] model decision makers behavior in this context by matching (i.e. "Do A because it is appropriate for situation S") instead of choice (i.e. "Do A because it has superior outcomes to its alternatives"). Based on this model, Niu et al.[177] propose a "thinking support module" to provide a set of tools for knowledge management, including a case base and a mental model or, more generally, explicit and tacit knowledge. Whereas cases are a form of explicit knowledge that can be described as a problem-solution pair,[178] mental models can be visualized as cognitive maps modeling the user's information needs. Another criterion is thus defined as the level of knowledge and thinking process support (R7).

From the IS support, March and Hevner[179] propose a data warehousing architecture with integration of external and internal data, as well as BI methods to interpret the information with respect to business. Niu et al.[180] mention online analytical processing (OLAP), SQL reporting, linear programming, and information fusion as methods for data analysis. Covering these aspects, the range of information interpretation (R8) is included as a next requirements criterion to the list approach.

In terms of *information usage* the best BI is worthless if their results are not recognized by managers and, as a consequence, not incorporated into their decision making process.[181] Bearing in mind that managers still tend to be technology-averse and most often have a cognitive working style,[182] the IS user interface is a key area determining IS acceptance. This thesis follows Warmouth and Yen[183] evaluating the design of an environmental scanning system's user interface in three dimensions; quality of information presentation (R9), user interface design and dialog control (R10), and advanced functionalities managers can perform themselves. In terms of the latter, especially communication functionalities (R11) are of interest. The ease of IS handling should help for a better information usage from IS-support perspective (R12).

[175] Cf. Tversky/Kahnemann (1974), pp. 1124-1131.
[176] Cf. Lipschitz/Klein/Orasanu/Salas (2001), p. 333.
[177] Cf. Niu/Lu/Zhang (2008), pp. 60-64.
[178] Niu et al. (2008) mention free-text approach, object-oriented approach, attribute-value approach, and predicate logic approach as different models for representing problem-solution pairs, pp. 55-72.
[179] Cf. March/Hevner (2007), p. 1041.
[180] Cf. Niu/Lu/Zhang (2007b), pp. 510-516.
[181] Cf. March/Hevner (2007), p. 1041.
[182] Cf. Jiang/Muhanna/Klein (2000), pp. 25-36.
[183] Cf. Warmouth/Yen (1992), pp. 192-208.

Cross-process factors contribute to several of the above-mentioned capabilities. First, the ability to adapt is of utmost importance in changing situations and turbulent environments.[184] Zott[185] defines timeliness as an important attribute of such dynamic capabilities (R13). Flexibility is added, the ability of the IS to adapt to changing information needs, data sources, and ways to present information (R14). Although Sutcliffe and Weber[186] state that how managers interpret their environment is more important than how accurately they know it, managers will not use information if it is questionable in terms of its formal aspects or content. This leads to requirements criteria of accuracy (content's accuracy, R15) and consistency (reliability of content, R16).

Interorganizational factors, such as a company's social embeddedness, increase its ACAP.[187] A strong business network enables information sharing and collection to increase the IS sensitivity to upcoming external events.[188] Gulati[189] proposes that companies should "create and utilize wide-ranging information networks." Given the importance of networking activities, supporting companies' level of interorganizational integration is another requirements criterion for applicable environmental scanning systems (R17). Automatic validation checks are an example for IS support in the cross-process factors. IS transparency should contribute to the cross-process factors (R18).

In terms of *effort*, the final requirements criteria consider the effort needed to design, implement, and set up environmental scanning systems. Zott[190] states that "even if dynamic capabilities are equifinal across companies, robust performance may arise […] if the costs and timing of dynamic capability deployment differ […]." Cost adequacy (R19) and time adequacy (R20) are defined as the last requirements criteria.

For simplicity the requirements list which has been developed in this chapter will be referred to as the evaluation model for the following sections. Even though it might be misleading as the requirements list can also be used to build up new systems, it is suitable for the purpose of this thesis.

[184] Cf. Eisenhardt/Martin (2000), p. 1106, Teece/Pisano/Shuen (1997), p. 516, and Pavlou/EL Sawy (2011), pp. 239-241.
[185] Cf. Zott (2003), p. 105.
[186] Cf. Sutcliffe/Weber (2003), pp. 74-82.
[187] Cf. Oh (2009), pp. 1-13, and Volberda/Foss/Lyles (2010), p. 941.
[188] Cf. Oh (2009), p. 3.
[189] Cf. Gulati/Nohria/Zaheer (2000), pp. 205-215.
[190] Cf. Zott (2003), pp. 97-125.

4.2 Methods: Integrating Results into Executives' Decision Making – An Exemplary Solution

The third gap in the previous literature review (Sec. 3.2) is concerned with the way of integrating results from environmental scanning into executives' decision making. The literature review revealed that some approaches already exist. In reality the integration of scanning results has to be company-specific. To show an exemplary solution that takes company-specific conditions into account this thesis an instantiation that was developed for a large international raw materials and engineering company is presented in this section (sales: EUR 47.97 bn; employees: 182,425).

In previous works, Mayer[191] set out for reworking environmental scanning systems resulting in a method consisting of six guidelines for increasing applicability:

1. Take a 360-degree approach, but select just the most important environmental scanning areas.
2. Define concrete descriptors and use IT to proactively identify relevant cause-and-effect chains.
3. Leverage IT to automate day-to-day routines and to follow the descriptor's movements.
4. Translate the descriptor's impact into a balanced opportunity-and-threat portfolio and leverage expert experience documented in an impact-matrix.
5. Incorporate scanning results into executive's decision-making process by generating scenarios from the set of environment assumptions.
6. Use retrospective controls to continuously update the IS and collaborate the scanning results in day-to-day work.

This approach is remarkable as it aims at creating a highly sophisticated solution with automated gathering and interpretation processes. As the instantiation revealed and as Mayer already mentioned, many companies cannot afford to develop such a solution in the first place. In most cases this is due to a missing executive championing the project since environmental scanning systems are not always on top of a CFO's agenda. For the instantiation mentioned in the following, Mayer's approach was taken as a guideline allowing deviations if necessary.

[191] Cf. Mayer (2011), pp. 276-290.

4.2.1 Objective

During the 2008/2009 economic crisis, especially the business side recognized that they could contribute better to executives' decision making with information about potential opportunities and threats in the environment. As the group follows very heterogeneous business models (from raw materials production to engineering solutions) and thus employs a decentralized organization structure, managers in the eight business units levels are rather independent in their decision making. However, they are integrated in the corporate risk management on group level and have to assess risks and chances concerning their business units for the corporate controlling department. In doing so, they are scanning their environment independently. This obviously results in inefficiencies as some areas are scanning the same environment (e.g. raw materials and economic situation) as well as missing areas and in diversity of reporting styles.

In order to standardize the scanning approach and to provide further information about the general environment (economic, social, and political) the corporate controlling department initiated the development of a new system. A 360-degree environmental scanning system was required, following three main objectives: (1) *Enhanced analysis of internal and external environment should provide more information*—going beyond standard business parameters to identify events, trends, and forces that could radically alter the future of the company. (2) Findings have to be *incorporated into executives' decision making*. Thus, an integration of the scanning results into group reporting in a standardized manner was mandatory. Based on these findings, executives should be enabled to get an overview of the environmental situation and better assess and monitor future opportunities and threats. (3) The system should be designed *focusing on perceived ease-of-use and perceived usefulness* as the most important parameters to increase executives' acceptance.[192]

4.2.2 System Design

First, in accordance to the first guideline, the areas for environmental scanning were delineated. Based on the framework presented by Mayer,[193] five groups of indicators were

[192] Perceived ease of use and perceived usefulness are the independent factor in the technology acceptance model (Davis (1989), pp. 318-340) determining the users behavioral intention of using the system.
[193] Cf. Mayer (2011), p. 281.

selected for environmental scanning on group level according to the company's strategy; economic situation, raw material prices, production, market development, and market forces such as suppliers, competitors, and customers. Obviously, some areas are specific for every business unit while others, such as the economic situation, are common on group level.

Next, descriptors were selected for each area, building a total of 55 indicators to be monitored. For each descriptor data sources were identified and update frequencies determined. Most information can be found on the internet, such as the country specific composite leading indicators (CLI) provided by the Organization for Economic Cooperation and Development (OECD).

With guidelines three and four, Mayer[194] proposed an automated gathering and interpretation based on a preset impact assessment of the single indicators on the companies' planning assumptions. A deviation from this aspect was caused by two reasons. First, automation in gathering is rather technology intensive and, as most external information to be used was accessible on the internet, the benefit of further gathering techniques were rather low. Second, indicators are most often difficult to interpret without further information and a simple preset impact assessment for automated interpretation is rather difficult. For example, the Baltic Dry Index[195] provides a concrete descriptor for the rates charged for chartering dry bulk vessels. It can be used to indicate economic development as a whole. But the Baltic Dry Index can be distorted by many sorts of factors specific to the shipping market that have nothing to do with commodities,[196] On the one hand, it signaled, for instance, the downturn due to the 2008/2009 economic crisis. On the other hand, it failed to show the recovery after the crisis due to overcapacities in vessels. It is therefore necessary to look at other indicators simultaneously to provide a valid interpretation. As can be deducted, cause-effect chains in a complex environment are not always as linear as they seem.

Another approach for interpretation was therefore chosen. Experts were identified in the company to undertake interpretation of indicator movements taking advantage of their personal mental models and thus incorporating multiple aspects into indicator evaluation. The interpreting expert will judge the indicator's current value as well as its performance in time

[194] Cf. Ibid., p. 282.
[195] The Baltic Dry Index measures freight rates for bulk goods such as iron ore, coal and soya beans, began to plummet. It is issued daily by the London-based Baltic Exchange.
[196] Cf. Risk (2011), p. 12.

and evaluate whether it is a *positive, a negative, or a neutral development* for the company symbolized by traffic light coding and additional comments. In addition to that, explanations, possible impacts on the company, and distorting factors were provided as a simple mental model base[197] for the users of the system. Therefore, at least two persons' assessments of indicator movements (expert interpreting indicator and executive using information) are incorporated into the environmental scanning process.

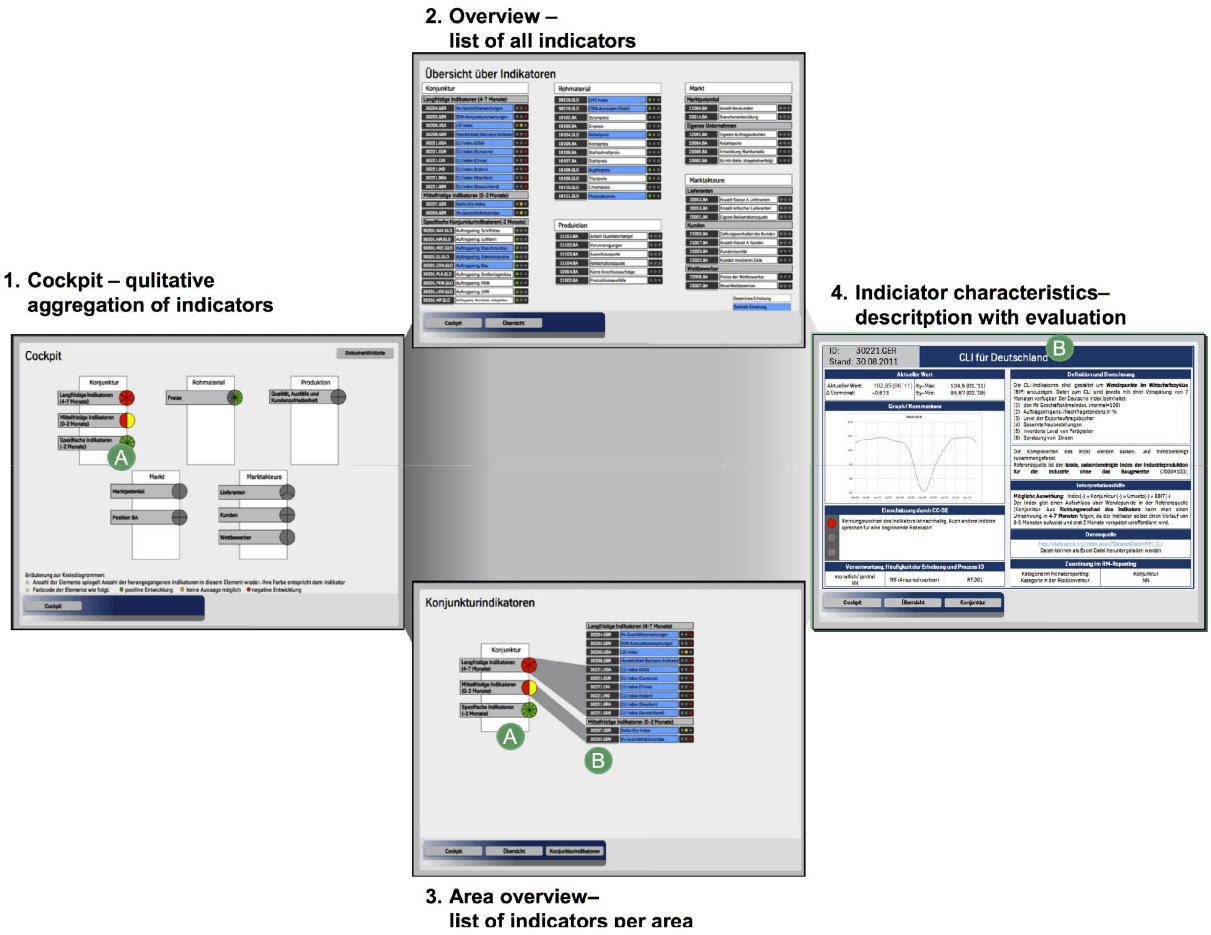

Figure 11: First instantiation for an environmental scanning tool

In order to integrate this information into executives' decision making (resembling guideline no. 5) a simple-to-use form of presentation was selected. On four different levels executives can use information starting with a highly aggregated level to a more detailed one and up to

[197] Cf. Niu/Lu/Zhang (2008), pp. 55-72.

viewing single indicators. User-interface components such as breadcrumbs and direct links (see A-A and B-B in Figure 11) provide an easy to use interface. Figure 11 shows the system.

The development focused less on modeling quantitative effects of certain developments in the environment on financial performance indicators such as EBIT, ROCE, and EVA and more on providing an *understandable overview about the company's environment*. Thus, instead of aggregating indicators synthetically with a diffusion index or by combining it directly with a scenario analysis[198], *qualitative aggregation on the first level was chosen* (Figure 11, left no. 1). In every area indicators are clustered in subcategories. For the economic situation area, for example, clusters are differentiated into indicator's time horizon (long-term, medium-term, and short-term). In every cluster indicators' assessment is summarized in a pie chart with one equally-sized piece showing the assessment ("green": positive, "red:" negative, or "yellow": neutral) of one single indicator. On the next level of analysis one can get an *overview over all indicator assessments* in sum or per area (Figure 11, middle no. 2 and 3). Last, *indicator characteristics* are presented on the detailed level (Figure 11, right no. 4). For every indicator this view contains information about current value and development in time as well as the evaluation provided by the interpreting expert on the left side. On the right side, information about the indicator itself and possible cause –effect chains are listed. Additionally, direct links make it possible to view more recent data directly on the internet. As a form of bias prevention, it is planned to incorporate a second evaluation interval in future.

In terms of the last guideline, the reporting tool is planned to be actualized on a monthly basis to proactively scan the areas of importance and collaborate findings form scanning efficiently throughout the corporation.

4.2.3 Lessons Learned

During the whole development process participants were actively asked for feedback. The following "lessons learned" give an impression of what was important to them and also the people designing the system.

[198] Cf. Mayer (2011), p. 283.

Lesson 1: Design for use is important to increase acceptance of the system. In this case, an overview about the environmental situation that is easy to understand is more important than showing the influence of single indicators on performance indicators such as EVA, ROCE, or EBIT. Executives asked for a simple form of presentation that makes it possible to get an overview at a glance. All participants were in favor of the qualitative aggregation approach. A first *clickable prototype* significantly enhanced acceptance in early phases.

Lesson 2: Integrating specialized expertise and individual experience is a key to create acceptance and enhance solution capabilities. It was of great importance for the system development to get people with specialized knowledge to work with it. By integrating expert assessment for indicator interpretation, these people got involved into the system and supported the development from the very first beginning.

Lesson 3: Adaptability is a central concern. The system designed here is a first version of an environmental scanning system. Further adaptations such as integrating new indicators will be necessary. Thus, adaptability of the system was one main objective. Especially in the underlying case where managers of different business units have to work with the same system, requests for additional information will come up.

5. Analysis of a Multi-Case Study

5.1 Research Design

Case studies are a research strategy and "as a research strategy, the distinguishing characteristic of the case study is that it attempts to examine: (a) a contemporary phenomenon in its real-life context, especially when (b) the boundaries between phenomenon and context are not clearly evident." [199] The research question usually being asked is of the type "how" and "why".[200] Since regulatory requirements and business needs force companies to implement environmental scanning system, real-world applications already exist. But the meaning of the phenomenon itself seems to be rather unclear because what is meant by "environmental scanning" varies across companies. Applying the case study research

[199] Cf. Yin (2003), p. 13.
[200] Cf. Ibid., p. 9.

approach thus seemed favorable to explore the real-world applications and to compare them to the theoretical work found in literature.

From Eisenhardt[201] three dimensions for case study research can be deducted: *(1) Aim of research* - Case studies can be used to accomplish various aims such as providing descriptions, generate or test theory. *(2) Data collection methods and data type* - For case study research one can enfold archives, interviews, questionnaires, and observations. Collected data will be within a continuum of qualitative and quantitative data. *(3) Case selection* - One can distinguish case studies observing single cases from case studies examining multiple cases. Examples in literature typically range between one and ten cases[202]. A forth and last dimension is mentioned by Yin.[203] *(4) Analysis and Reporting* – There are different ways of analyzing and reporting the case study results.

Aim of Research

First, regarding (1) the aim of research, this thesis does provide descriptions on five environmental scanning systems implemented in practice to show how "modern" Internet-IS capabilities can contribute. Due to the limited dataset of five cases, a general theory will not be generated, but the proposed design guidelines based on cross-case analysis should be a first step.

Data Collection Method

Second, for (2) data collection, *semi-structured interviews* were chosen. An interview is more interactive than a survey. It is an interaction between the interviewer and the respondent and thus is well suited to explore how things work. As Fontana et al. mentioned, “meanings of questions and responses are contextually grounded and jointly constructed by the interviewer and respondent.”[204] Interviewer can deviate from predefined manner to further investigate topics coming up during the interview and thus react on unforeseen object-specific issues. They can also deviate in case of obvious errors in the questionnaire. Interviews were

[201] Cf. Eisenhardt (1989), pp. 533-534.
[202] Cf. Ibid., p. 535.
[203] Cf. Yin (1981), pp. 61-64.
[204] Cf. Fontana/Frey (2000), p. 664.

conducted as face-to-face or telephone interviews lasting about 60 minutes each. They were conducted by at least two researchers; one concentrated on interviewing and one on documentation to enhance quality of the protocols.

Open-ended questions were used – one for each criterion of the *evaluation model* developed in Sec. 4.1. Every question had a qualitative and a quantitative aspect. For the former, respondents were asked to comment on how their IS fulfils the criterion. Speaking of the latter, respondents were asked to quantify their system's abilities for every criterion on a five-point ordinal scale. The recorded actual (as-is) and target (to-be) value for every criterion provides an insight about their information system's assessment. This method makes it further possible to obtain in-depth qualitative and quantitative data while ensuring comparability between responses[205]. As Yin[206] already noted, letting the subject of the study review their case study protocols reviewing ensures construct validity. Thus, respondents were asked to confirm interview protocols. The interviewers added personal impressions in italics.

Case Selection

Third, (3) appropriate cases have to be selected. Their number and individual characteristics can vary; the resulting research projects range from multi-level analyses of a single case study to single comparisons of multiple ones. Stake[207] described a variety of different case study types; intrinsic case study, instrumental case study, and collective case study. Unlike the first two methods the last one concentrates on jointly studying a number of cases in order to investigate a phenomenon and create a better understanding of the phenomenon itself. This has at least the advantage that analytical conclusions arising independently from multiple cases are more powerful than from single ones.[208]

In the beginning it was assumed, that many different real-world applications to environmental scanning systems exist. Thus, a *cross-company analysis of a collective case study* was conducted. Eisenhardt[209] suggests that cases should be extreme examples in which the aspect of interest is transparently observable. This thesis concentrated on large international

[205] Cf. Ibid., pp. 663-665.
[206] Cf. Yin (2003), p. 160.
[207] Cf. Stake (2000), pp. 437-438.
[208] Cf. Yin (2003), p. 53.
[209] Cf. Eisenhardt (1989), p. 536.

companies for three reasons: First such companies should have resources in quantity and quality to seriously pursue activities as environmental scanning. Second, regulatory requirements for stock-listed companies demand environmental scanning systems, and third, capital markets will punish negative developments in large international companies faster than they do for small or medium companies. Companies were chosen from the industrial sector because these companies evaluated the handling of uncertainties in comparison to previous times more difficult than the financial sector did in a preliminary survey.[210] Five European companies were chosen in different industrial sectors with different sizes. Respondents were selected according to their knowledge and position in the organization. As companies varied in how they organized environmental scanning within their organization, the respondents' department spans from corporate risk management and corporate controlling to the corporate BI department (Table 2, A. company characteristics and respondents).

	Company A	**Company B**	**Company C**	**Company D**	**Company E**
A. Company characteristics and respondents					
Revenue	€ 47.97 bn	€ 60.87 bn	€ 2.98 bn	€ 15.47 bn	$ 35.16 bn
Employee	182.425	243.275	12.971	47.768	130.000
Assets	€ 43.71 bn	€ 127.76 bn	€ 3.77 bn	€ 17.28 bn	$ 36.30 bn
Industry	Steel, engineering	Telecommunications	Imaging, Semiconductors	Chemicals, consumer products	Power technology, Industrial automation
Department	Corporate Controlling	Corporate risk department	Corporate business intelligence	Corporate risk management	Group Treasury
Interviewee	Senior Expert	Head of department	Head of department	Senior Expert	Senior Expert
B. Case presentation					
Objective	Towards a central approach in a formerly decentralized company bearing in mind head-quarters´ service provider role for divisions	Cooperative approach that intensely leverages knowledge from headquarters and divisions	Towards an BI umbrella approach in a diverse company structure	Deterministic, quantitative approach by headquarters	Collective learning approach by headquarter to leverage knowledge from divisions
Maturity	Early stage (starting 2010)	Mature stage for three years	Very early stage (starting 2011)	Mature stage for three years	Mature stage for three years
Focus group	Executives on group and especially on business unit level	CFO and other members of the group board, in an accessory mode executives of the divisions	Group board in an existing divisional approach	Group board	Group board and board of directors

Table 2: Researched companies and their environmental scanning systems[211]

[210] Cf. Mayer (2010), pp. 209-229.
[211] Source: Financial Reports, Interviews, November 2011

Analysis and Reporting Method

Last, (4) data analysis and presentation have to be specified. In this thesis a *one-time analysis* has been performed. Once all the interviews were completed, *within-case and cross-case* evidence were analyzed. Concerning the former, results and most important characteristics of environmental scanning systems are reported in Sec. 5.2. Yin[212] claimed that the report of case studies often follows a narrative structure and thus is hard to follow. To avoid this, results are reported according to *design criteria* used in Sec 4.1. Additionally, *cross-comparisons* contrasting interview data were performed. In particular, quantitative data was compared between cases. As-is values were cross-checked against the requirements given by the respondents (to-be values).

5.2 Within-Case Results

In the following section the results of case studies about five different companies are outlined. The section is organized as follows. The companies' environmental scanning systems are presented starting with an overview, followed by criteria evaluation, and an overall assessment. Additionally results in terms of IS objective, maturity, and focus group are summarized in Table 2.

Company A

Company A is the same company the exemplary IS in Sec. 4.2 was developed for. The environmental scanning system is allocated to the corporate controlling department. After governance was centralized at headquarters, the company began a redesign in 2010 towards a more central environmental scanning system in a formerly decentralized company. The system is based on Microsoft Office products and thus the IS support is very basic.

In terms of *information gathering,* the environmental scanning system is indicator-based and strictly has an operational focus determining for instance the economic situation in the midterm. Strategic risks are thus considered to a smaller degree. Possible improvements, however, are seen in increasing the focus on global "megatrends" and better integrating weak signals. Chances are included in the system but to a lesser extent. *Information interpretation*

[212] Cf. Yin (1981), p.64.

is based on expert's individual assessment of indicators which are clustered in five areas. In order to reduce biases, generic cause effect chains are provided as mental models (tacit knowledge). Explicit knowledge is incorporated through expert's knowledge. These persons will take account of experiences made in past decisions. The information provided by the system is addressed to executives on business units and group level. Thus, qualitative aggregation and some navigation functionalities are included that enable *information usage* according to individuals' cognitive working style. Up to this moment, communication functionalities are not relevant at all. In terms of *cross-process factors* especially flexibility was an important paradigm during system's development. Thus, it can quickly be adapted to changing requirements by introducing new indicators. Existing indicators are updated on a monthly to quarterly basis depending on their availability. Interorganizational integration is not performed in the recent status but is seen advantageous. Concerning the *effort* that is taken, the costs for the development were very low but the implementation took a long time. Three people are currently involved in risk management and operating the system besides their daily business.

Summing up, the system is at an early stage of maturity and provides information to *executives at group and division level*. For the latter, headquarters sees itself as a *service provider* with centralized environmental scanning governance, processes, and templates.

Company B

Company B is a telecommunications company. Before the 2008/2009 economic crisis, environmental scanning was mainly focused on regulatory compliance, and sometimes was used simply to confirm strategic decisions in retrospect. Since that time, especially the corporate risk department took the opportunity to develop their role as business partners within the company. Environmental scanning is now performed as a service task for top level executives. The scanning results are quarterly reported to the board within a reporting instrument called "risk cockpit." It includes approximately 100 single indicators with special interest on country specific developments, regulatory needs, special taxes, and factors influencing consumer behavior. IT support is limited to the collection of data for risk assessment. This tool, which was developed by a company's subsidiary, is separated from the

reporting tool. As the reporting is optimized for executive's use, it is prepared quarterly and has the format of a booklet.

In terms of *information gathering*, the system of Company B focuses more on strategic risks than on operational ones and it even incorporates weak signals. A possible improvement is seen in the operationalization of defined scenarios and weak signals. Besides risks, chances are considered as well although to a lower degree. *Information interpretation* is dominated by expert interviews within and outside the group. Specialist departments are assigned to interpret single indicators and observe scanning areas. The group department combines these single aspects into a big picture. Since the system is not based on a quantitative and mathematical model, experts can use their own experience and mental models. For example, employees' past experiences from Japan and other countries are used to understand the crisis in Greece. Coming to *information usage*, the reporting is optimized for board executives' use only and thus does not include sophisticated navigation functionalities since it is optimized for their purposes. The provided information is rather sensitive and only for personal use. Thus, there is no need for communication functionalities. Concerning *cross-process factors,* the focus of environmental scanning systems is to give an overview about developments in the environment and to synthesize single results into an overview of the situation. New indicators or new topics are integrated from time to time and with little effort leading to a high level of flexibility. The gathering and interpretation process, which includes discussions with decentralized experts, needs a lot of time. The frequency thus is chosen to be quarterly. An important factor in Company B is the integration of external partners. Banks, for instance, are consulted to enhance interpretation of the economical situation. However, information from the system is not shared with others. Regarding the *effort*, the system in use was developed along with the daily business. Eight employees are assigned to the main department and thus are managing this process but many others are integrated in the whole evaluation process.

In a nutshell, the environmental scanning system of Company B is already at a mature stage. *A cooperative approach that intensely leverages knowledge from headquarters and divisions* with a central governance, processes, and templates were examined. Expert discussions are a key element for gathering and interpreting scanning indicators. The risk cockpit is sophisticated, focusing on information for the *corporate CFO* and *other members of the board* and in an accessory working mode for executives at the division level.

Company C

Company C is a manufacturer of optical systems, industrial measurement equipment and medical devices. Due to the different business models in its affiliated companies, Company C currently does not have an integrated and standardized environmental scanning system on group level in place. Some subsidiaries and especially the ones operating in high developed technology markets have already implemented sophisticated systems. But these systems differ a lot, ranging from single reports consisting of a collection of indicators to highly institutionalized systems for permanent monitoring. After the economic crisis in 2008/2009 and in the light of the events of the summer 2011 the need for having one integrated environmental scanning system on group level became obvious. Thus, the head of corporate BI was charged to standardize information presentation and aggregation of environmental scanning results. No attempt will be made to create a central scanning approach. Instead, a modern BI umbrella approach with analytical methods will be implemented to support a central and decentralized interpretation, graphical presentation, drill-through analysis and communication of information in a standardized way.

In terms of *information gathering* the current environmental scanning system focuses on strategic and operational risks to the same extent. Strategic risks are assessed based on external indicators rather than weak signals which are rarely treated in a formal system. *Information interpretation* is based on expert's assessments. Therefore, experience held by individuals or departments can be used for interpretation purposes. In contrast to explicit knowledge, no tacit knowledge is systematically incorporated. Since the respondent recently became head of the project, no assessment for bias prevention could be given. Up to the moment, scanning results are sometimes reported within written reports without making use of any form of graphical presentation. Thus, *information usage* capabilities are at a low stage. Furthermore, indicators are often presented incompletely and lack a superordinate structure. Improvement is seen in an integrated BI solution, making information usage according to individuals' cognitive style possible. Considering *cross-process factors,* scanning frequency ranges from daily to monthly data collection. In future, frequency should be indicator-related providing the most accurate information possible at a time. Due to the manual character of the system, flexibility is high, however, it will be reduced by future standardization efforts. The *effort* of running the system was not assessable by the respondent.

In brief, the environmental scanning system is at a *very early stage of maturity* with the *central board as the focus group*. Nevertheless, development aims at an intensive utilization of IS and thus contributes to the research.

Company D

Company D is in the chemicals and consumer products industry. The issue of a central environmental scanning system became evident during the 2008/2009 economic crisis. Company D distinguishes between the detection of risks and the detection of business opportunities. While the risks are covered in a centralized and standardized approach, business opportunities are pursued by the divisions. A deterministic, quantitative approach to the evaluation of risks and opportunities is preferred over individual assessment. In this sense, environmental scanning is performed using two to five market indicators and their associated tolerance levels. Then, this external perspective is compared to forecast financial indicators, such as revenue and EBIT, in the form of three different scenarios. The results are sent to the central board members to support them in balanced opportunity and risk management. Depending on the external and the internal perspective, predefined actions have to be taken by business units (e.g. introducing short-time work). Analyses have been performed preliminary to prove correlation between indicators and market development. A simple implementation of an IS can be found as only Microsoft Office is used.

The system focuses more on operational than strategic risks for *information gathering* .Weak signals are not incorporated at all and the balance between chances and risks is clearly dominated by the latter. Objectivity in *information interpretation* activities is reached by the *deterministic character* of interpretation. Whereas deviation from predefined actions is possible, indicator interpretation is fully automated. Knowledge and thinking process support is indirectly involved as preliminary correlation analyses quantified chosen indicators' impact on market performance based on historical data. Speaking of *information usage*, results are then communicated within a 3x4 matrix and presented to the board once a year and quarterly to the business units. In case of an actual crisis, presentation frequency is increased. As the presentation is based on Microsoft PowerPoint, navigation is one-dimensional. Ease-of-use has been an important paradigm in the system design. The respondent, however, criticized that complexity should be increased to improve functionality. In terms of *cross-process*

factors, the indicator analysis is performed quarterly but the board reporting is only done on a yearly basis in case of no exception. The flexibility is high because new indicators can quickly be integrated into the process. The selection of new indicators in general requires statistical analysis which is time consuming. External partners are fully excluded and there is no exchange of information neither for gathering nor for interpreting purposes. Three to four persons in combination with internal sources developed the system in six months constituting the *effort*. The development costs are considered adequate whereas the time needed could have been less. The operating effort is quite low with a total of 0.5 persons a year.

Summing up, the system run by Company D is *rather mature* but differs essentially from those seen in the other companies. It follows a *deterministic and quantitative approach*. The system also exceeds pure information purpose by employing predefined actions and thus can be seen as a controlling instrument. It mainly addresses the group board but gives essential input for division management as well.

Company E

Company E is operating in the technology and industrial automation segment. Soon after the financial crisis an overall risk management process was introduced which was developed in one of the company's subsidiaries. This process contains a systematized environmental scanning process. On group level this process is exclusively designed for top management support and managed by the group treasury department. Therefore, scanning results are reported weekly to the board of executives and quarterly reviewed by the board of directors. To distribute reports, a Microsoft SharePoint solution is used. Reports are based on Microsoft Office. Besides Microsoft products, no need is seen for further specialized IS.

In terms of *information gathering,* the environmental scanning system strictly has a strategic risk focus on group level. Up to the moment, chances are only considered to a small degree but this has already been identified as a deficiency. Business development teams have been created in the divisions to focus on chance identification. The system is decentralized and information is collected from every division. *Information interpretation* is based on standardized reports with detailed instructions for preparation. Findings and analyses are reviewed by at least two employees. Cause-effect chains are only provided to a small degree but standardized templates help in interpretation. Statistical methods are used to correlate

business growth to certain indices and additionally a self developed, complex forecasting model exists to extrapolate GDP growth in most important countries. SharePoint functionalities create a rather good level of *information usage*. Users are satisfied with the system and no web-based application is desired. Even though navigation functionality is rather basic, the Microsoft SharePoint system makes information easily accessible and provides further communication functionalities. Simple graphical elements are used to symbolize whether a development is positive or not. In terms of *cross-process factors* the system provides a good level of timeliness and flexibility, as new reports can easily be added. In terms of the former, information is provided on a weekly basis. The focus is on the overall relationship of data. Thus, single information is of less importance. Up to the moment, no other external partners are included in the process besides providers of external data such as press clipping services. Generally, the integration of supply chain partners is appreciated. Concerning the *effort*, costs that were taken for development are considered adequate compared to the utility of the system. Development took one year for the conception and three months for the implementation of the SharePoint with three employees engaged. The overall risk management process took additional nine months to develop. The technical support counts about 0.1 full time equivalent employees a year

In a nutshell, the system is at a mature stage. It supports the collective learning throughout the company, providing information for *top level management at group level*. The top-down and bottom-up method enables multiple views on future development.

5.3 Cross-Case Results

The semi-structured interview included a quantitative part which will be used in this section to support qualitative aspects. The respondents were asked to rate their current environmental scanning system according to the criteria of the evaluation model (Figure 12, as-is profiles) and what level they think their system should achieve (Figure 12, to-be profiles). For both cases a five-point ordinal scale from values "1" (very low) to "5" (very high), determining level of fulfillment, was used. Assessment results of all companies are juxtaposed in Figure 12 and discussed in the following. As a general meaning for the absolute level was not provided throughout the interview, comparing absolute levels does not make any sense. However, analyzing gaps, which are determined by the difference between to-be and as-is

values given by the respondents, does provide reasonable insights in areas for potential improvements (API). The arithmetic mean across all gaps is named mean gap (Figure 12, column 7). In addition, results are also shown without Company C, as their environmental scanning system is not located at a business, but a BI department.

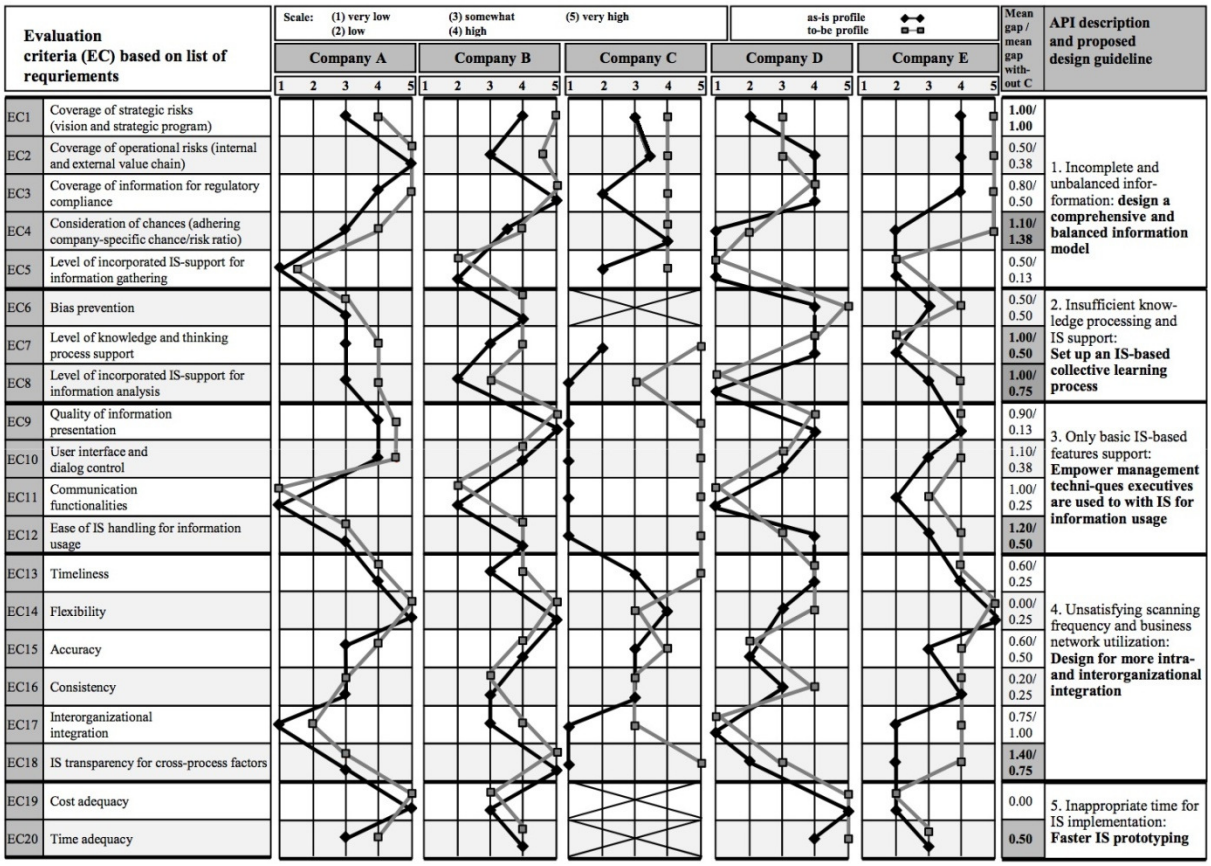

Figure 12: Cross-case comparison of quantitative self-assessments

Starting with *information gathering* (EC1-5), all companies agree that they have to increase their *strategic focus* (EC1) – topics related to the company's vision and strategic program (to-be values between 3 and 5; mean gap=1). For example, Company A focuses on risks in terms of raw materials prices, production capacities, customer discounts covering the market situation for the next three month, but they do not leverage weak signals such as rumors and trends for the long-term development, especially global "megatrends." In turn, whereas Company A and C are satisfied with their coverage of *operational risks* Company B and E wish to improve in this field (EC2, mean gap=0.50). Company D even argued that they collect too much operational information over time (Company D, Figure 12). Likewise, information for *regulatory compliance* is not a central issue. All companies fulfill the regulatory needs (EC3, mean gap without Company C=0.50). Indeed, Companies A, C, and E mentioned a

positive gap but only concerned with a potential to grow for their own level of interpretation and satisfaction. In terms of the *company specific chance/risk ratio* (EC4), Company A, B, D and especially E agreed that they focus more on risks than on chances and that they need to improve on this issue (mean gap without Company C =0.83). As with Company A, chances are only covered if they are directly related to the current business model. For example, upcoming chances in emerging markets, non-related to current business are overlooked. Because of its decentralized approach, Company C's scanning system considers opportunities in greater detail than the central systems from other companies' do (as-is/to-be value=4). Company E already recognized this problem and started business development teams that should improve chance realization. In current applications further information especially for strategic aspects is needed and thus completing information and rebalancing focus can be concluded as the first area for potential improvements (API).

API 1 – Incomplete and unbalanced information

For all companies *IS support for gathering information* (EC5) is at a basic level (as-is values between "1: very low" and "2: low") and little improvements are seen for IS (mean gap without Company C= 0.13). For example, at Companies B and D MS Office tools are used and no need for improvement is seen. In contrast, Company C, in which the process is championed by the head of the BI department, wants to establish an integrated BI solution with automated IS-functionalities for information gathering. This may be due to his personal preference for "modern" IS, but it generally shows possibilities in this field. For Company E, even though process is not championed by an IT-expert, a collaborative approach using SharePoint has been applied to improve gathering functionalities.

With regards to *information interpretation* (EC6-8), two complementary approaches were identified for the purpose of *bias prevention in interpretation* (EC6). On the one hand, Company D relies on a deterministic interpretation based on indicators in combination with tolerance levels. Company A, on the other hand, interprets five information clusters, each based on an internal expert assessment, to enable their own assessment. Company B does also follow the latter approach and concentrates on a cooperative approach with several expert interviews to integrate even informal information of the internal and external environment into interpretation. Group risk management then synthesizes these single aspects into a big picture. A collective approach is also chosen by Company E for which at least two experts

review analyses results. However, most companies, and especially the ones following the second approach, are satisfied with how they prevent biases in interpretation (mean gap=0.50). Company C could not give an assessment for this criterion due to its decentralized organization. In terms of *knowledge and thinking support* (EC7), tacit knowledge is either included with generic cause-effect-chains supporting individual assessment (Company A) or as a correlation analysis of financial indicators (e.g., EBIT) resulting in tolerance levels (Company D). Explicit knowledge is always integrated through including experts' individual knowledge from past decisions. As Company B uses a cooperative approach with several expert interviews, integration of expert knowledge is rather high. In other companies than Company B, this integration does take place in a less systematic way. Most companies do see this as a major point for further improvements (mean gap=1.00). Like in the case of information gathering, *IS support for information interpretation* (EC8) is also at a basic level (as-is values between "1" and "3") and most often leverages MS Excel functionalities. Besides Company D, all companies agree to further IS improvements (mean gap=1.00). Company A and B argue for additional aggregation of qualitative information within the IS support, whereas Company E already applies statistical methods in an extrapolation model for country-specific GDP. As a second API, an insufficient knowledge processing and a lack for applicable IS support can be concluded. Knowledge is most often held by few people and companies do not put enough effort in processing knowledge that could be used for environmental scanning.

API 2 – Insufficient knowledge processing and IS support

Information usage capabilities (EC9-EC12) vary widely. Depending on the company's degree of centralization the addressee can either be a board member such as the CFO or business unit executives or both levels. This directly influences the type of navigation functionalities and quality of information presentation needed. Company B for instance only reports results to the CFO and thus their system is focused on information needs of one person. Excluding Company C which currently has no system in place on group level, the other ones see little need to improve this criterion (EC9/EC10 mean gap without Company C=0.5/0.38).

Furthermore, all others than Company C and E see little value in communication functionalities (EC11, mean gap=0.25 without Company C), three out of five companies see the ease of IS handling as improvable (EC12, mean gap=0.50, without Company C=1.20). Thus, the third API should be:

API 3 – Only basic IS-based features support

As the first *cross-process factor*, companies rate the *timeliness* (EC13) of their environmental scanning from "3: somewhat" to "4: high." The variety of scanning frequencies varies from quarterly (Company B) to monthly (Company A) or even weekly for selected areas (Company E). At Company D, analysis is performed quarterly, but board reporting takes place just once a year. Overall, companies would consider a more frequent process to be an improvement (mean gap=0.60). As most IS are based on MS Office, average *flexibility* (EC14) is rated "high" (mean gap=0). Data changes are adopted on a monthly to quarterly basis. *Accuracy* (EC15) is granted average, since IS are generally focused on providing an overall impression rather than accurate information. Existing IS already fulfill the criterion of *consistency* (EC16), and four out of five companies do not see a need for improvement in this respect (mean gap=0.20).

For the next criterion, *interorganizational integration* (EC17), Company B already actively uses business partners for interpretation purposes, whereas none of the others have anything comparable in place. This company even includes banks to enhance their interpretation of the economic situation. However, most companies want to improve in this aspect (mean gap=0.75). Concluding with the *IS transparency* (EC18), Companies A and B are satisfied with the validation they currently use, whereas C, D, and E see opportunities for improvement (mean gap=1.40, mean gap without C=0.75). As reporting is optimized for executive's usage, it takes the form of a booklet with access to important topics. Leveraging more advanced IS support is seen as necessary. Concluding a fourth API, a need for increased timeliness while preserving flexibility can be stated.

API 4 – Unsatisfying scanning frequency and business network utilization

In terms of *effort* (EC19 und EC20) cost adequacy is not an issue for environmental scanning systems right now (EC19, mean gap=0). *Time adequacy*, in turn, is under criticism (EC20, mean gap =0.50). At Company A, three risk management employees were involved in the IS design in addition to their day-to-day work. Thus, implementation took a long time. At

Company B, eight workers designed IS, but others were integrated as well, producing an IS that is considered to be sophisticated. Company C was unable to assess the effort for their satellite IS as their development was directed by the divisions. Four internal sources were needed to develop Company D's environmental scanning system in six months. They considered the time needed for this setup, especially the IS implementation, as too long. Company E needed one year for concept development. Thus, a fifth API concerned with the inappropriate time adequacy can be concluded.

API 5 – Inappropriate time for IS implementation

6. Guideline Synthesis

Following Yin, the findings from the case studies can be used as a basis for design guidelines to develop novel, testable, and valid knowledge.[213] After reviewing the cross-case results, this section will focus on design guidelines that tackle the APIs determined in Sec. 5.3.

***Information gathering - design a more comprehensive and balanced information model*:** Regarding *information gathering,* current environmental scanning systems are dominated by an operational focus (EC2) and concerned with fulfilling regulatory needs (EC3). One reason is that indicators foreseeing strategic issues (EC1) lack grasp in practice. All companies realized that they need to focus more on a forward-looking risk management and to balance chance and risk ratio (EC4). As Company B shows in their within-case results, the strongest lever for that is an intra- and interorganizational coordination of information gathering. For the former, it is seen as useful to integrate multiple levels of employees in an organization to enhance exchange with the company's environment. Company E's concept of chance-oriented divisional business development teams could also help to balance risk/chance ratio. Interorganizational integration, as another lever, can be useful to improve response time to new developments. Some industries are facing threats earlier than others. Additionally, Company D argues for the principle of the balanced scorecard that should lead to a more comprehensive information model. Thus, a first design guideline for environmental scanning to be more applicable than those designed by previous research can be outlined as follows:

[213] Cf. Yin (1981),pp. 62-63.

Design Guideline 1: *Companies can improve the information model of their environmental scanning systems with a more forward-looking chance and risk management balancing operational and strategic aspects. The strongest levers are intraorganizational coordination and interorganizational integration for information gathering.*

The IS support for such an information gathering (EC5) was rather underdeveloped across all companies. The respondents stated that no standardized IS exists. They are looking forward for a cockpit approach giving an overview about reasoning on cause-effect chains based on a framework of most important scanning areas. As in Company D, where a BI head is championing the process, more concrete IS capabilities are on the future course. Data mining and semantic search should be helpful. According to his statement, most currently, keyword text search could be used to scan indicators of future events. In addition, neural networks should be helpful to generate indicators.

Information interpretation - set up an IS-based collective learning process: Within *information interpretation* two different approaches have been researched to reduce biased interpretation (EC6): deterministic and multi-individual heuristic interpretation. In terms of leveraging knowledge (EC7), the respondents argued for incorporating senior experts instead of using IS such as mental models and case bases. For Company B, improvements would entail operationalizing weak signals of country developments, regulatory requirements, taxes, and factors influencing how consumers use telecommunications technology in scenarios for company growth. Following Blanco and Lesca[214], a collective learning process is proposed similar to the multi-individual heuristic interpretation. System's and participant's interpretation capabilities can be improved by including multiple opinions and enabling an active exchange between participants. Company E also uses an in-house developed extrapolation model for capital expenses and GDP. Regarding the IS support for information interpretation, Companies A and B argue for additional aggregation of qualitative information. They are willing to extend the range of information interpretation. Indicator maps, for example, enhance quantifying threats and opportunities. Company E implemented a SharePoint solution which makes a direct exchange with responsible authors possible. Thus, a second design guideline to overcome personal biases and to consider personal expertise in an IS-based collective approach can be concluded:

[214] Cf. Blanco/Lesca (1998), pp. 1-15.

Design Guideline 2: *Environmental scanning systems should enhance an IS-based collective learning process for better information interpretation. The capabilities can be improved by including multiple opinions within the IS and enabling an active exchange of perspectives between the participants.*

Information usage - Empower management techniques executives are used to with IS: Since all environmental scanning systems were currently based on MS Office, IS capabilities for information usage are quite basic. Even though respondents were satisfied with their information presentation, user interface and dialog control, and communication capabilities (EC9-11), Company C gave interesting insights about future capabilities for more sophisticated IS-based environmental scanning systems. For example, various types of *information presentation* such as impact matrices, dashboards, balanced scorecards and value-driver trees in combination with scenarios or balanced chance- and risk portfolios can be combined with *navigation functionalities* such as hierarchical structures and drill-downs that enable information usage according to individual's cognitive working style and responsibility. Empowering management techniques executives already use with other IS (modern EIS) will also increase their user attitude towards IS in environmental scanning.

Design Guideline 3: *IS-based impact matrices, dashboards, balanced scorecards, chance- and risk portfolios and value-driver provide multiple types of information presentation. Combined with modern navigation functionalities for users from the business perspective, environmental scanning systems can adapt to executives' individual cognitive working styles and responsibilities.*

Cross-process factors - Design for more intra- and interorganizational integration: Timeliness (EC13) and flexibility (EC14) are factors for environmental scanning systems that can often only be managed in a tradeoff. In all cases, companies are clearly aspiring towards monthly frequency for external and often daily frequency for internal information. They also do not want to reduce the flexibility of the system to adapt to changing requirements. Going hand-in-hand with information gathering, interorganizational integration is an interesting avenue to increase scanning's efficiency (EC17). Following Company B, integrating external partners directly into environmental scanning process will enhance gathering and interpretation capabilities. Increasing speed of internal information gathering, environmental scanning systems should integrate into transactional databases to get most recent data.

Design Guideline 4: *Environmental scanning systems should support an integrated business network and thus become a multidirectional platform for insights on future developments. It should also integrate into transactional IS to increase information's timeliness.*

Effort - faster IS prototyping: In terms of effort, time adequacy (EC20) is a final issue in environmental scanning system design. Up to the moment, system development sometimes took half a year for first versions. That is lowering project's support from business side. *Prototyping* is a technique to fasten IS development. Especially, portfolio and dashboard applications should help to reduce implementation effort. Since they are now available in vendor portfolios, they can easily be integrated into overarching IS architectures.

Design Guideline 5: *Prototyping should be used more actively for environmental scanning system design to provide an early sense of a "look & feel". A clickable version should stimulate feedback from the business side and at the end perpetuate participants' IS acceptance from the very first moment.*

7. Evaluation

In this section the *evaluation model* on hand will be evaluated in two different ways. First evaluation will be based on the results from the multi-case study research. For a second evaluation, a closer look at the development process based on criteria from requirements engineering (Sec. 2.2) will be taken.

7.1 Evaluation Based on Case Study Results

Interviews for the case studies were based on the *evaluation model* developed in Sec. 4.1. During the interviews, this structure significantly helped to set a common understanding of the field of environmental scanning systems. In general, respondents could easily answer questions. They provided a structured explanation of their systems and provided an assessment for every single criterion. This made it possible for the interviewer to get an overall picture of the systems. Utility and applicability during the interviews thus already proved evaluation model's usefulness.

Moreover, results were used to identify gaps in current real-world applications. Respondents themselves were able to *identify gaps for further improvements* by defining as-is and to-be values for every single criterion on a rating scale from 1 (very low) to 5 (very high). To tackle these gaps by leveraging insights from case studies and literature review, design guidelines have been developed for every design criterion. Up to this moment, design guidelines have not been applied in practice.

The evaluation model not only helped interviewers and respondents to constitute a conceptualization of the environmental scanning systems domain and to structure interviews but also to develop reasonable and meaningful design guidelines. Even though future research has to challenge their contribution to more applicable environmental scanning systems, case study results proved evaluation model's applicability.

7.2 Evaluation Based on Development Process

Comparing the *evaluation model* to the other list approaches discussed in Sec. 3.3 and using the criteria from RE derived in Sec. 2, the proposed development process has the following advantages.

The principle of economic efficiency is widely *accepted* – in business-management research, IS research, and in practice. As a reliable, frequently applied design paradigm, it provides a generally accepted basic scheme for requirement analysis of IS in general and the design of environmental scanning systems in particular. That increases the acceptance of the approach on hand. From a conceptual perspective, deriving design criteria from a theory is *scientifically rigorous.* As cross-functional IS aspects were also included, the presented approach should lead to a "good" level of *distinctiveness*. Models can never be exhaustive enough as they will always simplify. Nonetheless does the approach on hand provide a better level of *completeness* than the others and thus rated "somewhat". Considering *relevance*, case study results show real-world applicability of the evaluation model. Thus, its level of relevance is considered slightly better than other approaches that have rarely been applied at all. Results are summarized in Figure 13.

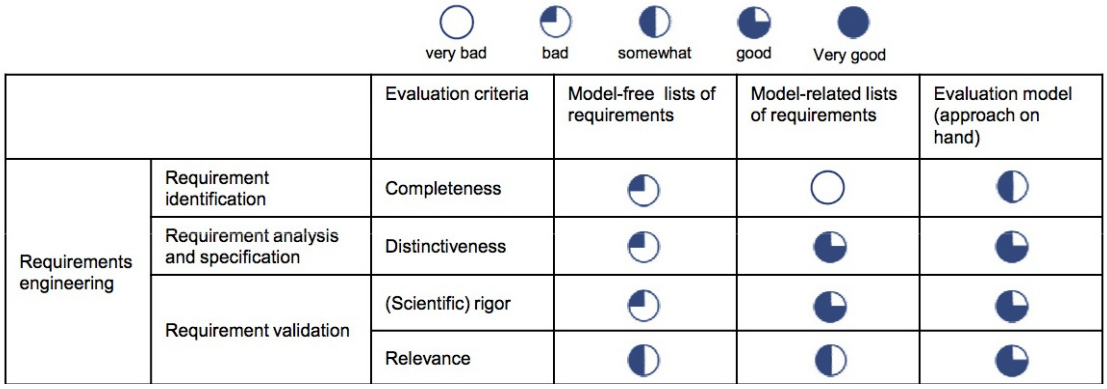

Figure 13: Evaluating the approach on hand in comparison to other list approaches

Nevertheless the evaluation model is surely *not exhaustive*. Relating environmental scanning to the absorptive capacity theory is a new approach. It can be criticized that using theory for evaluating applicability is a contradiction. But research about supporting factors of these theoretical constructs is logically based and has been subject to other empirical investigations. Comparing this approach with those that just use own experience and random literature, the model presented in this thesis is more *systematic* and contains *less subjectivity*.

8. Conclusion

This work contributes to a more applicable environmental scanning systems design with an evaluation model, an exemplary solution, and design guidelines derived from a comparative case study. This last section will summarize the work in a nutshell, discuss limitations, and give a prospect on future areas of research.

8.1 Summary

Sec. 1 outlined the need for a more applicable environmental scanning systems design starting with both empirical evidence and regulatory requirements. This time is favorable for a redesign for two reasons. Among today's executives acceptance of information systems is increasing while new technologies of the internet era also advance.

Sec. 2 then introduced the reader to the concepts of environmental scanning systems and provided further insights on what is meant by environmental scanning systems. Moreover,

environmental scanning systems were connected with the theories of RBV, DCV, and the ACAP construct.

Incorporating a systematic approach for literature review, Sec. 3 presented concepts and results of the performed literature review. The review resulted in 111 publications from which *three literature gaps* for more applicable environmental scanning were derived; a lack of sound requirements analysis, a lack of "grasp" to apply weak signals in practice, and a lack to provide solid information interpretation and to closer incorporate environmental scanning results into executives' decision making.

Based on the literature review and tackling *the first and the third gap*, an evaluation model for a sound requirements analysis and an exemplary solution were presented in Sec. 4. The evaluation model was developed through a systematic approach to a list of requirements criteria in Sec. 4.1. Starting with the principle of economic efficiency as a superordinate concept and using findings from ACAP theory, criteria were derived that can either be used as an evaluation model for existing environmental scanning systems or to *build up a new, more applicable generation*, which has not been covered in this thesis. In terms of the *third gap*, Sec. 4.2 presented an exemplary solution that was developed for an international materials and engineering company.

Demonstrating applicability of the evaluation model and generating design guidelines from real-world applications, a multi-case study was conducted and reported in Sec.5. For analysis of the cases, within-case and cross-case analysis were performed identifying *five areas for potential improvements (APIs)* according to the five design criteria; information gathering, information interpretation, information usage, cross-process factors, and effort. Based on these areas, Sec. 6 then synthesized the results from the multi-case study into five design guidelines.

Finally, Sec. 7 evaluated the approach in terms of the results and the development process. The section showed that the approach on hand has several advantages compared to the ones found in literature.

8.2 Limitations and Future Research

The objective of this thesis was to contribute to more applicable environmental scanning systems than those designed by previous research. Therefore, an *evaluation model*, an *exemplary solution,* and, using the former, *design guidelines* based on a multi-case study have been developed. Even though an acknowledged design science research process has been used, a few limitations stand out due to methodology:

First, a literature review is *limited to a restricted number of researched publications* and thus can never be exhaustive. Especially in this thesis a preliminary literature research was enlarged incorporating new search strings. However, the fact, that the leading journals are covered and that a broader search string was used, ensures that major contributions should be included. Further research could adapt more journals and enlarge the search string to more entirely trace the field of environmental scanning systems.

A second limitation can be recognized for the compiled requirements in the *evaluation model*. Although these were based on a systematic approach starting with the widely accepted principle of economic efficiency, some readers might argue that the selection of requirements criteria within the domain of design criteria is rather random. There is no logic evidence for disproving this argument in total but compared to other approaches in literature that determined requirements based on own experience and a collection of best practices, the evaluation model does provide certain improvements.

Obviously, other limitations of the case study approach itself indicate avenues of future research as well. Case studies are often seen as *complementary to statistical methods*. Compared to these, case studies' main *strength is depth*. One could criticize that due to this focus, the thesis did not present the breadth of possible environmental scanning systems. But as the focus of this thesis concentrated on understanding the phenomenon itself and finally fostering guidelines for more applicable environmental scanning systems, case studies seemed to be the best method due to their *high conceptual validity*. Furthermore, case studies helped to understand the context of environmental scanning systems in companies and their processes to prove validity of the developed evaluation model. Still some limitations are left due to the methodology. As case studies focus on few cases, they provide a *weak understanding of occurrence in total*. Further, statistical significance is rather unknown. It could turn out, that for some reasons; the companies chosen are the only ones that applied

such approaches at all. Further research thus must provide analysis aiming at breadth to understand how widespread this phenomenon is.

The guidelines developed in this thesis should serve as predefined ways to redesign existing environmental scanning systems or to bring new-generation ones to life. As a last limitation, this article does not include a *substantial evaluation process* of the design guidelines or the subsequent design of new-generation environmental scanning systems itself. These areas should be the subject of further research.

In addition to the future research possibilities, there are other avenues that could be of interest in the field of environmental scanning systems. Focusing on the IS support, *mobile IS solutions* could tremendously enhance the suggested collective learning process in Sec. 6. Employing smartphones, tablets and other upcoming devices could make environmental scanning systems ubiquitous and pervasive throughout the company. Up-to-date information from environmental scanning systems could be used anytime and anywhere. Security concerns are the most limiting factor in this context. Engineers have to regard this fact and thus have to implement authentication and encryption procedures. Besides security, using mobile IS also requires specialized user-interfaces. Smaller screen size, other control philosophy, and sheer portability clearly create other possibilities that have to be regarded throughout the development of new generations. Mobile IS create a vast variety of opportunities. Enabling these opportunities clearly will boost potential of environmental scanning systems.

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Appendix A: List of Identified Publications

Table A1[215]

No	Author(s)	Year	Title	Publication	Elements of IS design	Research approach
1	Aasheim, C. & Koehler, G.J.	2006	Scanning the World Wide Web documents with the vector space model	Decision Support Systems	Information gathering	Case study
2	Aguilar, F.	1967	Scanning the Business Environment	Macmillan	Information gathering	Survey
3	Ahituv, N. et al.	1998	Environmental Scanning and Information Systems in relation to success in introducing new products	Information & Management	Nonfunctional requirements	Survey
4	Albright, K.	2004	Environmental Scanning: Radar for Success	The Information Management Journal	Information gathering	Single/list approaches
5	Anderson, M.H. & Nichols, M.L.	2007	Information Gathering And Changes in Threat and Opportunity Perceptions	Journal of Management Studies	Information gathering	Experiment
6	Ansoff, H.I.	1975	Managing Strategic Surprise by Response to Weak Signals	California Management Review	3rd generation IS	Framework
7	Ansoff, H.I.	1980	Strategic Issue Management	Strategic Management Journal	3rd generation IS	Framework
8	Arnott, D. & Pervan, G.	2008	Eight key issues for the decision support systems discipline	Decision Support Systems	Information gathering	Single/list approaches
9	Averweg, U.R. & Roldán, J.L.	2006	Executive Information System implementation in organisations in South Africa and Spain: A comparative analysis	Computer Standards & Interfaces	Information gathering	Case study
10	Bergeron, F., Raymond, L., Rivard, S.	2004	Ideal Patterns of Strategic Alignment and Business Performance	Information & Management	Information gathering	Survey
11	Blanco, S. & Lesca, H.	1998	Busienss Intelligence: Integrating Knowledge into the Selection of Early Warning Signals	RIS-Proceedings	Information gathering	Case study
12	Boyd, B. & Fulk, J.	1996	Executive Scanning and perceived Uncertainty: A multidimensional Model	Journal of Management	Information gathering	Survey
13	Calori, R.	1989	Designing a Business Scanning System	Long Range Planning	3rd generation IS	Framework
14	Cecchini, M. et al.	2009	Making words work: Using financial text as predictor of financial events	Decision Support Systems	Information gathering	Case study
15	Chen, H. et al.	2011	Enterprise risk and security management: Data, text and Web mining	Decision Support Systems	Information gathering	Single/list approaches
16	Cho, T.	2006	The effects of executive turnover on top management teams: environmental scanning behavior after an environmental change	Journal of Business Research	Information gathering	Survey
17	Choo, C.W.	1999	The Art of Scanning the Environment	Bulletin of the American Society for Information Science	Information gathering	Framework
18	Choo, C.W.	2001	The knowing organization as learning organization	Education + Training	3rd generation IS	Framework
19	Cohen, J.B. & Zinsbarg, E.D.	1967	Investment Analysis and Portfolio Management	Homewood	1st generation IS	Single/list approaches
20	Daft, R. & Weick, K.	1984	Toward a Model of Organizations as Interpretation Systems	Academy of Management Review	Information gathering	Framework

[215] New elements compared to the results of Mayer/Steinecke/Quick (2011) are shaded gray.

21	Daft, R.L. et al.	1988	Chief Executive Scanning, Environmental Characteristics and Company performance: An Empirical Study	Strategic Management Journal	Functional requirements	Survey
22	Daheim, C. & Uerz, G.	2008	Corporate Foresight in Europe: From trend based logics to open foresight	Technology Analysis & Strategic Management	3rd generation IS	Survey
23	Davies, J. et al.	2006	Key Risk Indicators - Their Role in Operational Risk Management	RiskBusiness International Limited	2nd generation IS	Framework
24	Day, G.S. & Schoemaker, P.J.H.	2004	Driving through the Fog: Managing at the Edge	Long Range Planning	Information gathering	Single/list approaches
25	Day, G.S. & Schoemaker, P.J.H.	2005	Scanning the Periphery	Harvard Business Review	Functional requirements	Single/list approaches
26	El Sawy, O.	1985	Personal Information Systems for Strategic Scanning in Turbulent Environments: Can the CEO go online?	MIS Quarterly	Nonfunctional requirements	Survey
27	Elofson, G. & Konsynski, B.	1991	Delegation Technologies: Environmental Scanning with intelligent agents	Journal of Management Information Systems	Information gathering	Case study
28	Elofson, G. & Konsynski, B.	1993	Performing organizational learning with machine apprentices	Decision Support Systems	3rd generation IS	Framework
29	Fontela, E.	1976	Industrial Applications of Cross-Impact Analysis	Long Range Planning	Information interpretation	Single/list approaches
30	Frolick, M. et al.	1997	Using EISs for Environmental Scanning	Information Systems Management	3rd generation IS	Framework
31	Fuld, L.	2003	Be Prepared	Harvard Business Review	3rd generation IS	Survey
32	Garg, V. et al.	2000	Chief executives scanning emphasis, environmental dynamism and manufacturing company performance	Strategic Management Journal	Information gathering	Survey
33	Gelle E. & Karhu K.	2003	Information quality for strategic technology planning	Industrial Management and data systems	Information gathering	Case study
34	Glassey, O.	2008	Exploring the weak signals of start-ups as a folksonomic system	Technology Analysis & Strategic Management	3rd generation IS	Framework
35	Gleißner, W. & Füser, K.	2000	Moderne Frühwarn- und Prognosesysteme für Unternehmensplanung und Risikomanagement	Der Betrieb	Information interpretation	Single/list approaches
36	Gomez, P.	1983	Frühwarnung in der Unternehmung	Haupt	3rd generation IS	Framework
37	Goul, M. & Corral, K.	2007	Enterprise model management and next generation decision support	Decision Support Systems	Information gathering	Single/list approaches
38	Gray, P.	2008	From Hindsight to Foresight: Applying Futures Research Techniques in Information Systems	Communications of the Association for Information Systems	Information interpretation	Single/list approaches
39	Gray, P.	2001	A problem-solving perspective on knowledge management practices	Decision Support Systems	Information interpretation	Survey
40	Habib, J.	2008	The Dynamics of Knowledge Creation Within Innovation Process From Case Studies to Agent Based Modelling	ICIS-Proceedings	Information gathering	Case study
41	Hahn, D. & Krystek, U.	1979	Betriebliche und überbetriebliche Frühwarnsysteme für die Industrie	Zeitschrift für betriebswirtschaftliche Forschung	2nd generation IS	Framework

42	Hambrick, D.C.	1981	Specialization of Environmental Scanning Activities Among Upper Level Executives	Journal of Management Studies	Information gathering	Survey
43	Hand, D.	2009	Mining the Past to determine the future	International Journal of Forecasting	Information interpretation	Single/list approaches
44	Heinrichs, J.H. & Lim, J.-S.	2003	Integrating Web-based Data Mining Tools with Business Models for Knowledge Management	Decision Support Systems	Information interpretation	Experiment
45	Hough, J. & White, M.	2004	Scanning actions and environmental dynamism	Management Decision	Information gathering	Survey
46	Huang, A.H.	2003	Effects of Multimedia on Document Browsing and Navigation: An Exploratory Empirical Investigation	Information & Management	Information usage	Experiment
47	Jain, S.C.	1984	Environmental Scanning in US Corporations	Long Range Planning	Information gathering	Survey
48	Jourdan,Z. et al.	2008	Business Intelligence: An Analysis of the Literature	Information Systems Management	Information gathering	Single/list approaches
49	Krystek, U.	1993	Frühaufklärung für Unternehmen: Identifikation und Handhabung zukünftiger Chancen und Bedrohungen	Schäfer-Poeschel	3rd generation IS	Framework
50	Kuvaas, B.	2002	An Exploration of two competing perspectives on informational contexts in top management strategic issue interpretation	Journal of Management Studies	Information usage	Survey
51	Lauzen, M.	1995	Toward a Model of Environmental Scanning	Journal of public Relations Research	3rd generation IS	Survey
52	Lee, L. et al.	2006	The Role of Electronic Integration and Absorptive Capacity on Interorganizational Cost Management in Supply Chains	ICIS-Proceedings	Information gathering	Survey
53	Lenz, R. & Engledow, J.	1986	Environmental Analysis Units and Strategic Decision-Making: A field study of selected leading edge companies	Strategic Management Journal	3rd generation IS	Survey
54	Lenz, R. & Engledow, J.	1986	Environmental Analysis: The Applicability of current Theory	Strategic Management Journal	3rd generation IS	Framework
55	Lesca, N. & Caron-Fason, M.-L.	2008	Strategic Scanning Project Failure and abandonment factors: Lessons learned	European Journal of Information Systems	Information gathering	Survey
56	Levine, R.	2004	Risk Management Systems: Understanding the Need	Information Systems Management	Information interpretation	Framework
57	Liu, R.-L. & Lu, Y.-L.	2003	Distributed Agents for Cost-effective Monitoring of Critical Success Factors	Decision Support Systems	Information gathering	Experiment
58	Liu, R.-L., Lin, W.-J.	2005	Incremental mining of information interest for personalized web scanning	Information Systems	Information gathering	Case study
59	Liu, S.	1998	Data Warehousing Agent: In seeking of improved support for environmental scanning and strategic management	RIS-Proceedings	Information gathering	Case study
60	Liu, S.	2000	Agent Based Environmental Scanning System: Impacts on Managers and Their Strategic Scanning Activities	AMCIS-Proceedings	Information gathering	Case study

61	Liu, S.	1998	Business environment scanner for senior managers: towards active executive support with intelligent agents	Expert Systems with Applications	Information gathering	Single item
62	Lönnqvist, A. & Pirttimäki, V.	2006	The Measurement of Business Intelligence	Information Systems Management	Functional requirements	Single/list approaches
63	Ma, Z., Sheng, O.R.L., Pant, G.	2009	Discovering company revenue relations from news: A network approach	Decision Support Systems	Information gathering	Single/list approaches
64	Maier, J.L., Rainer, R.K., Snyder, C.A.	1997	Environmental Scanning for Information Technology: An Empirical Investigation	Journal for Management Information Systems	Information gathering	Survey
65	Makridakis, S.	2010	Why Forecasts fail. What to Do Instead.	MIT Sloan Management Review	1st generation IS	Single/list approaches
66	Malhorta A., Gosain S., El Sawy, O.A.	2005	Absorptive capacity configurations in supply chains: gearing for partnerenabled market knowledge creation	MIS Quarterly	Information interpretation	Case study
67	March, S.T. & Hevner, A.R.	2007	Integrated Decision Support Systems: A Data Warehouse Perspective	Decision Support Systems	Information interpretation	Framework
68	McMullen, J. et al.	2009	Managerial (In)attention to Competitive Threats	Journal of Management Studies	Information usage	Survey
69	Menon, A. & Tomkins, A.	2004	Learning About The Markets Periphery: IBM´s Web Fountain	Long Range Planning	Information gathering	Case study
70	Müller, R.M.	2010	Business Intelligence and Service-oriented Architecture: A Delphi Study	Information Systems Management	Information gathering	Survey
71	Nanus, B.	1982	QUEST - Quick Environmental Scanning Technique	Long Range Planning	Information usage	Framework
72	Narchal, R. M. et al.	1987	An Environmental Scanning System for Business Planning	Long Range Planning	3rd generation IS	Framework
73	Nastanski, M.	2003	The value of active Scanning to senior executives	Journal of Management Development	Information gathering	Survey
74	Nemati, H. et al.	2000	A Multi-Agent Framework for Web Based Information Retrieval and Filtering	AMCIS-Proceedings	Information interpretation	Single/list approaches
75	Ngai, E.W.T. et al.	2011	The application of data mining techniques in financial fraud detection: A classification framework and an academic review of literature	Decision Support Systems	Information gathering	Framework
76	Nick, A.	2009	Wirksamkeit strategischer Früherkennung	Gabler	3rd generation IS	Case study
77	Niu, L., Lu, J., Zhang, G.	2007	Enriching Executives' Situation Awareness and Mental Models - A Conceptual ESS Framework	ICEIS-Proceedings	Information interpretation	Framework
78	Nunamaker, J.F., Weber, E.S., Chen, M.	1989	Organizational Crisis Management Systems: Planning for Intelligent Action	Journal for Management Information Systems	Information usage	Framework
79	Ontrup, J., Ritter, H., Scholz, S.W., Wagner, R.	2009	Detecting, Assessing, and Monitoring Relevant Topics in Virtual Information Environments	IEEE Transactions on Knowledge and Data Engineering	Information gathering	Survey
80	Palvia, P. et al.	1996	Information Requirements of a Global EIS: An Exploratory Macro Assessment	Decision Support Systems	Information gathering	Survey

81	Pant, G. & Sheng, O.R.L.	2009	Avoiding Blind Spots: Competitor Identification Using Web Text and Linkage Structure	ICIS-Proceedings	Information gathering	Experiment
82	Pawar, B.S. & Sharda, R.	1998	Obtaining Business Intelligence on the Internet	Long Range Planning	Information gathering	Framework
83	Plambeck, N. & Weber, K.	2010	When the glass is half empty and half full: CEO interpretation	Strategic Management Journal	Information usage	Survey
84	Prahalad, C. K.	2004	The Blinders of dominant Logic	Long Range Planning	Information gathering	Single/list approaches
85	Qi, M.	2001	Predicting US recessions with leading indicators via neural network models	International Journal of Forecasting	Information usage	Survey
86	Qiu, T.	2007	Scanning for competitive intelligence: A managerial perspective	European Journal of Marketing	Information gathering	Survey
87	Rajanemi, K.	2007	Internet-based scanning of the competitive environment	Benchmarking: An International Journal	Information gathering	Case study
88	Reichmann, T. & Lachnit, L.	1979	Unternehmensführung mit Hilfe eines absatzorientierten Frühwarnsystems	Zeitschrift für Betriebswirtschaft	1st generation IS	Framework
89	Romeike, F.	2005	Frühaufklärungssysteme als wesentliche Komponente eines proaktiven Risikomanagements	Controlling	3rd generation IS	Single/list approaches
90	Rossel, P.	2009	Weak Signals as a flexible framing space for enhanced management and decision-making	Technology Analysis & Strategic Management	3rd generation IS	Framework
91	Schoemaker, P.J.H. & Day, G.S.	2009	Gathering Information: How to make sense of weak signals	MIT Sloan Management Review	Information gathering	Single/list approaches
92	Simon, H.	1959	Theories of Decision-Making in Economics and Behavioral Science	The Economic Review	Information usage	Framework
93	Singh, S., Watson, H.J., Watson, R.T.	2002	EIS Support for the Strategic Management Process	Decision Support Systems	Information usage	Survey
94	Smallman, C. & Smith, D.	2003	Patterns of Managerial Risk Perceptions: Exploring the Dimensions of Managers Accepted Risks	Risk Management	Information usage	Survey
95	Sonnenschein, O.	2005	DV-gestützte Früherkennung	Controlling	3rd generation IS	Framework
96	Suh, W. et al.	2004	Scanning behavior and strategic uncertainty	Management Decision	Information usage	Survey
97	Taleb, N. et al.	2009	The Six Mistakes Executives Make in Risk Management	Harvard Business Review	Information usage	Single/list approaches
98	Tan, S. et al.	1998	Environmental Scanning on the Internet	ICIS-Proceedings	Nonfunctional requirements	Survey
99	Thietart, R.A. & Vivas R.	1981	Strategic Intelligence Activity: The Management of the Sales Force as a Source of Strategic Information	Strategic Management Journal	Information gathering	Case study
100	Thomas, P.	1980	Environmental Scanning - State of the Art	Long Range Planning	Information gathering	Case study
101	Thomas, J.B. et al.	1993	Strategic Sensemaking and organizational performance: Linkages among scanning, interpretation, action and outcomes	Academy of Management Journal	Information usage	Survey
102	Tseng, F.S.C. & Chou, A.Y.H.	2006	The concept of document warehousing for multi-dimensional modeling of textual-based business intelligence	Decision Support Systems	Information interpretation	Framework

103	Vandenbosch, B. & Huff, S.L.	1997	Searching and Scanning: How Executives Obtain Information from Executive Information Systems	MIS Quarterly	Information usage	Survey
104	Walters, B. et al.	2003	Strategic Information and Strategic decision making: the EIS-CEO interface in smaller manufacturing companies	Information & Management	Functional requirements	Survey
105	Wei, C.-P. & Lee, Y.-H.	2004	Event detection from online news documents for supporting environmental scanning	Decision Support Systems	Information interpretation	Single/list approaches
106	Wheelwright, S. & Clarke, D.	1976	Probing Opinions	Harvard Business Review	1st generation IS	Single/list approaches
107	Wixom, B.H. et al.	2008	Continental Airlines Continues to Soar with Business Intelligence	Information Systems Management	Information gathering	Case study
108	Xu, K. et al.	2011	Mining comparative opinions from customer reviews for Competitive Intelligence	Decision Support Systems	Information interpretation	Framework
109	Xu, X. et al.	2003	UK executives Vision on business environment for information scanning. A cross industry study	Information & Management	Functional requirements	Survey
110	Yasai-Ardekani, M. & Nystrom, P.	1996	Designs for Environmental Scanning Systems: Tests of a contingency theory	Management Science	Functional requirements	Survey
111	Zhang, Y. et al.	2009	Automatic Online News Monitoring and Classification for Syndromic Surveillance	Decision Support Systems	Information gathering	Experiment

Appendix B: Interview Protocols

In the following the protocols from all five companies are printed.

Institut für Wirtschaftsinformatik

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Evaluation strategischer Früherkennungssysteme

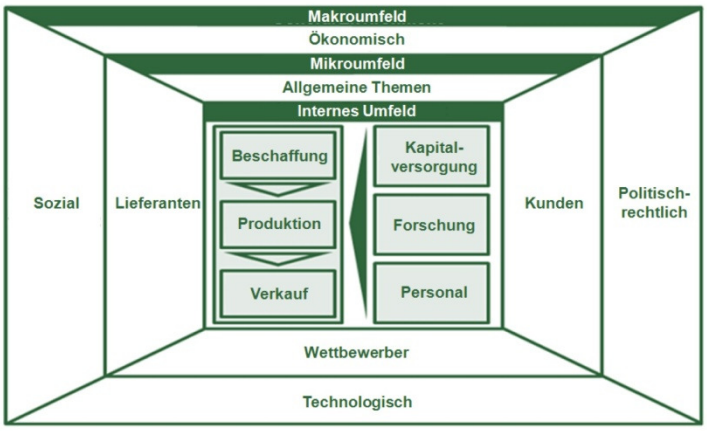
Das Interview beläuft sich auf etwa 60 min und umfasst zwei Teile (Grundlagen und Evaluation).

Einleitung

„Strategische Früherkennungssysteme dienen zur Sammlung, Interpretation und Nutzung relevanter Informationen aus dem internen und externen Umfeld. So sollen Ereignisse, Trends und Beziehungen vorhergesagt werden; dies insbesondere um die Unternehmensleitung in der Planung ihrer zukünftigen Handlungen zu unterstützen." (Aguilar 1967)

Frühere Untersuchungen haben gezeigt, dass man das Umfeld eines Unternehmens in verschiedene Beobachtungsbereiche einteilen kann:

- Makroumfeld:
  - Ökonomischen Einflüssen
  - Politische Einflüsse
  - Soziale Einflüsse
  - Technologische Einflüsse
- Mikroumfeld:
  - Allgemeine Themen
  - Kunden
  - Lieferanten
  - Wettbewerber
- Internes Umfeld
  - Wertschöpfungskettenaspekte (Beschaffung, Produktion, Absatz)
  - Wertschöpfungsketten unterstützende Aspekte (e.g. HR, R&C, Capital Supply)



Company A

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1 Grundlagen (10 Min)

1. Welchen Stellenwert nimmt die strategische Früherkennung in Ihrem Unternehmen ein?
   - Seit KontraG bereits in die Risikoinventur, einen halbjährlichen Prozess zur Erfassung aller Risiken, integriert jedoch ohne Vorgaben an die operativen Einheiten und ohne Standards zur Durchführung zu definieren.
   - Strategische Früherkennung ist ein Reportingprozess mit zwei Addressaten; Sowohl Vorstand als auch Leiter der operativen Einheiten. Gerade letztere sollen dadurch befähigt werden früher Risiken und Chancen für Ihre Bereiche zu identifizieren
   - Im Rahmen der Weiterentwicklung des Risikomanagement wird die strategische Früherkennung nun ausgeweitet um eine qualitative Verbesserung zu erzielen. Viele Informationen auch informeller Art sind im Unternehmen bereits vorhanden und sollen nun gebündelt und den Entscheidungsträgern zur Verfügung gestellt werden
   - Wesentliche Indikatoren: Momentan sind in Summe 55 verschiedene Indikatoren zur Analyse ausgewählt
2. Wie hat sich dieses Thema in den letzten Jahren, vor allem nach der Finanzkrise von 2008/2009 entwickelt und gab es Anpassungen an die Krise bzw. nach der Krise?
   - Früher deutlicher Fokus auf Anforderungen des KontraG.
   - Nach der Krise ist ein deutlicher Schub zur Implementierung eines Risikomanagementsystems zu spüren, das bei strategischen unternehmerischen Entscheidungen unterstützt und zur Krisenfrüherkennung beiträgt
   - Dies äußert sich auch in einer Umstrukturierung des Risikomanagements. Diese Abteilung war früher dem Konzernbereich Auditing zugeordnet und wurde nach der Krise zum 30.09.2009 an den Bereich Controlling angegliedert. Risikomanagement soll Bestandteil einer wertorientierten Unternehmenssteuerung werden.
3. Wird die strategische Früherkennung als Dienstleistungsprozess der Konzernzentrale an die operativen Einheiten aufgefasst oder welche Selbstauffassung haben Sie?
   - Momentan ein Dienstleistungprozess sowohl an Konzernführung als auch an operative Führungen in den Business Areas. Das „FEICockpit“ soll beiden Ebenen gleichermaßen zur Verfügung gestellt werden.
4. Welche Fachbereiche in der Konzernzentrale und welche operativen Einheiten verantworten die strategische Früherkennung in Ihrem Unternehmen (verschiedene Konzernabteilungen und operative Einheiten)?
   - Startegische Früherkennung ist auf mehrere Konzernabteilungen, sowie auf die operativen Konzernunternehmen verteilt. Im Zuge der Weiterentwicklung soll dies nun auch in gewissem Maße zusammengeführt und standardisiert werden
   - Dezentrale Ansprechpartner in den Business Areas sollen aktiv mit eingebunden werden
5. Existiert ein standardisierter Prozess der Früherkennung mit IT-Unterstützung oder wird diese eher „ad hoc“ für gewisse Größenordnungen (Eintrittswahrscheinlichkeit, Schadenspotential) ausgeführt?
   - Momentan: ad-hoc Prozess ohne größere IT-Unterstützung
   - System zur strategischen Früherkennung soll zunächst in einem standardisierten, pragmatischen und modularen Prozess realisiert werden
   - In einem zweiten Schritt wird dann über eine mögliche IT-Unterstützung nachgedacht werden

2 Evaluation (45 Min)

Zur Beurteilung Ihres Früherkennungssystems legen wir eine fünfstufige Likertskala zugrunde sowohl für den IST als auch für den SOLL-Wert zu Grunde. Bitte beurteilen Sie wie folgt: „1“: sehr gering, „2“: gering, „3“: neutral, „4“: hoch, „5“: sehr hoch

2.1 Informationssammlung (10 Min)

1. In welchem Maße ist Ihr Früherkennungssystem auf *strategische Risiken* ausgerichtet (? Wie werden diese erfasst? Berücksichtigen Sie auch schwache Signale wie Tendenzen, Stimmungen, etc?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
3	**4**	• Verbesserungspotential wird in einer stärkeren Berücksichtigung schwacher Signale gesehen. • Die wichtigsten Untersuchungsbereiche sind momentan abgedeckt • Strategische Trends (Globalisierung, Urbanisierung etc) können noch mehr berücksichtigt werden

2. In welchem Maße ist Ihr Früherkennungssystem auf *operative Risiken* ausgerichtet? Wie werden diese erfasst? Berücksichtigen Sie auch schwache Signale?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
5	**5**	• System ist momentan eher auf operative Risiken ausgerichtet. Fokusiert auf Marktsituationen, Marktakteure, eigene Produktion sowie Rohstoffpreisentwicklungen • Hier wird eine hohe Abdeckung gesehen.

3. Deckt ihr System maßgebliche *regulatorische Anforderungen* wie Gesetz zur Kontrolle und Transparenz im Unternehmensbereich (KonTraG), IFRS 1 „foreseeable future of at least one year“ oder SOX Section 404 „documentation of internal controls“ ab?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
4	**5**	• Bisherige Maßnahmen zur strategischen Früherkennung waren bereits ausreichend um ein uneingeschränktes Testat von den Wirtschaftsprüfern zu bekommen. • Integration in das Risktool, ein Instrument das bei der Erfassung der Chancen und Risiken von den Business Areas verwendet wird, würde eine noch besser Verknüpfung von Früherkennung und Risikomanagement erzielen.

4. Werden neben Risiken auch *Chancen* gleichberechtigt berücksichtigt?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
3-4	**4**	• In der Beobachtung der Indikatoren und deren Einschätzung durch die Fachabteilungen sind prinzipiell beide Richtungen möglich. • Geschäftsfremde Chancen werden nicht berücksichtigt

5. Existiert eine *IS-Unterstützung*, um die Intensität und die Geschwindigkeit Ihrer Informationssammlung zu steigern?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
1	**1,5**	• IT-Unterstützung zur beschleunigten Sammlung ist momentan kein Fokus und es wird in näherer Zukunft keine Notwendigkeit gesehen, dies zu verbessern. • Die meisten benötigten Informationen sind im Internet frei zugänglich, können aus ERP-Systemen der Business Areas entnommen werden oder stehen aus Marktstudien zur Verfügung.

2.2 Informationsinterpretation (10 Min)

6. Die Interpretation von Informationen ist ein subjektiver Prozess. Persönliche Unzulänglichkeiten und Vorurteile können die Deutung der Indikatoren beeinflussen. Wird dieser Aspekt in Ihrem System durch *definierte Vorgehensweisen* vermieden?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
3	**3**	• Deutung der Indikatoren übernimmt jeweils eine Fachabteilung, die sich diesbezüglich besser auskennt. Die Interpretation wird jeweils als Kommentar erfasst und kann so auch andere Einflüsse, die zur Deutung notwendig sind mit einbeziehen. • Eine Interpretationsunterstützung im Sinne von beispielhaften Ursache-Wirkungsketten je Indikator soll auch den Anwendern helfen eine Interpretation vorzunehmen und so eine zweite Ansicht beizusteuern

7. Die Interpretation der Indikatoren ist oft schwierig und zeitaufwendig. Dieser Prozess sollte daher Erfahrungen im Sinne von *Wirkungsketten* oder das Wissen aus vergangenen Entscheidungen berücksichtigen. Inwieweit wird dieser Prozess von Ihrem Systems abgedeckt?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
3	**4**	• Beispielhafte Interpretationsunterstützung wird je Indikator in Form von möglichen Auswirkungen auf das Unternehmen dargestellt. • Vergangene Entscheidungen werden nicht gespeichert. Da jedoch die interpretierenden Fachabteilungen gleich bleiben werden, sollte so eine Einbeziehung vorangegangener Entscheidungen möglich sein

8. Durch welche Methoden wird die *Analyse der Indikatoren* unterstützt? Sind z. B. Data Mining Technologien oder anderer Algorithmen vorhanden, um Zusammenhänge zwischen Indikatoren und finanziellen Kennzahlen herauszuarbeiten?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
3	**4**	• Da es sich um ein auf Microsoft PowerPoint und Excel basiertes Instrument handelt, stehen alle dort verfügbaren Analysemethoden zur Verfügung. • Neben einfachen Trendanalysen werden Korrelationsanalysen eingesetzt um Auswirkungen auf das Unternehmen zu verifizieren.

2.3 Informationsnutzung (10 Min)

9. Wie würden Sie die *Informationsdarstellung* Ihres Systems bewerten? Wie ist das Feedback der Führungskräfte und der Fachabteilung?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
4	**4,5**	• System hat mehrere Adressaten (Vorstand und Leiter der Business Areas) • Zusammenstellung von wesentlichen Indikatoren im „FEIcockpit“ für Führungskräfte. Diese werden qualitativ aggregiert um eine Aussage zu wichtigen Bereichen der Umwelt zu kondensieren • Eine verständliche Darstellung war eine der Hauptanforderungen bei der Entwicklung

10. Wie würden Sie die *Navigationsfreundlichkeit* innerhalb Ihres Systems bewerten? Wie ist das Feedback der Führungskräfte und der Fachabteilung?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
4	**4,5**	• Breiter Anwenderfokus macht eine Anpassung an individuelle Bedürfnisse unmöglich. • 3 Ebenen zur Analyse mit einfachen Navigationselementen sollen allen Anwendern gleichermaßen eine gezielte Nutzung der Informationen ermöglichen.

11. Gibt es innerhalb Ihres Systems *Kommunikationsfunktionalitäten*? Ist es Ihnen beispielsweise möglich aus dem System heraus eine Anfrage an eine betreffende Person per Email, Kurznachricht oder persönlichem Gespräch zu stellen?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
1	**1**	• Kommunikationsfunktionen sind nicht relevant. • Emailfunktionalitäten in Risktool werden ebenfalls nicht genutzt

12. Über die genannten Punkte 9 bis 11 hinaus, wie schätzen sie die *nutzerfreundliche* Verwendung der gesammelten und interpretierten Informationen sicher? Wie gehen Sie dabei mit historischen Informationen um?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
3	**3**	

2.4 Prozessübergreifende Aspekte (10 Min)

13. Wie zeitnah erfasst, verarbeitet und stellt Ihr System mögliche Chancen und Risiken Ihnen zur Verfügung? Ist dies für alle Beobachtungsbereiche gleich oder gibt es dort Unterschiede?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
4	**4**	• System wird maximal monatlich aktualisiert. Einige Angaben lassen sich jedoch nur in größeren Zeitintervallen erfassen. Dies ist nicht abhängig von den Beobachtungsbereichen, sondern Indikatorspezifisch.

14. Wie *flexibel* kann Ihr System auf Veränderungen in Ihrer Aufgabenstellung wie z. B. neue Beobachtungsbereiche oder Frühindikatoren reagieren?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
5	**5**	• Hoher Fokus liegt auf modularem Aufbau um das System schnell und einfach um weitere Indikatoren erweitern zu können und auch neue Beobachtungsbereiche hinzuzunehmen

15. Wie *genau* (Vorlaufzeit, Eintrittswahrscheinlichkeit, Schadenspotential, sowie Indikatordaten insgesamt) sind die Informationen, die Ihnen bereitgestellt werden? Legen Sie mehr Wert auf den Gesamtzusammenhang oder steht die Genauigkeit einzelner Angaben im Vordergrund?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
3	**4**	• Fokus liegt eher in der Erfassung von Entwicklungen, Trends und Gesamtzusammenhängen. • Da das System derzeit noch stark von der Risikoerfassung im Rahmen der Risikoinventur separiert ist, ist eine genaue Quantifizierung von Auswirkungen im Rahmen der strategischen Früherkennung noch nicht nötig jedoch angedacht.

16. Wie schätzen Sie die *Zuverlässigkeit* ihres Systems im Sinne einer Vermeidung von Manipulationen, Störungen und technischer Fehler?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
3	**3**	• Geringe Komplexität daher zuverlässig. • Keine zusätzlichen Kontrollmechanismen

17. Inwieweit werden unternehmensübergreifend wie Lieferanten, Kunden, Forschungspartner etc. in Ihrem System integriert? Gibt es Kooperationen zur Sammlung, Interpretation und oder Nutzung von Informationen?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
1	**2**	• Keine formale Integration vorhanden. Bisher werden nur allgemein verfügbare Informationen genutzt • Ein Austausch mit anderen Unternehmen ist denkbar

18. Inwieweit sind IT-gestützte Validierungsprüfungen innerhalb ihres Systems vorhanden? Gibt es darüber hinaus Maßnahmen, die die Transparenz des Systems steigern sollen? (Prozessdarstellungen etc.)

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
3	**3**	• Prozessdarstellung zur Erfassung und Bearbeitung der Indikatoren vorhanden. Darüber hinaus gibt es keine Validierungsprüfungen

2.5 Aufwand (5 Min)

19. Welche *Kosten* sind bei der Entwicklung des Früherkennungssystems entstanden und was sind in etwa die Kosten des laufenden Betriebs (Anzahl Mitarbeiter, Software, Hardware)?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
5	5	• 3 Leute für RM im Controlling parallel zum Tagesgeschäft. • Strategische Früherkennung wird parallel zum Tagesgeschäft durchgeführt. • Geringe Beratungs- und Entwicklungskosten bei der Erstellung.

20. Wie hoch war die Zeit, die zur Konzeption und Implementierung des IS aufgewendet wurde und wie ist der laufende Zeitbedarf der Pflege (Verhältnis zwischen Zeitaufwand und Nutzen)?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
3	4	• Zeitintensive konzeptionelle Erstellungsphase mit großem Abstimmungsaufwand. • Zeitbedarf der Pflege angemessen. • Integration in ein umfassendes Tool für Risikomanagement und strategische Früherkennung steht noch aus.

Company B

Institut für Wirtschaftsinformatik

Universität St.Gallen

Grundlagen (10 Min)

1. Welche Rolle (Bedeutung/Aufgaben) hat die strategische Früherkennung in Ihrem Unternehmen?
   - Schwerpunkt des Reportings liegt auf Vorstandsunterstützung: CFO als direkter Adressat, ausgewählte Teile gehen aber auch an Fachabteilungen und operative Einheiten
   - Ergebnisse fließen in ein quartalsweise aktualisiertes Risikocockpit, hier werden verschiedene Frühindikatoren und ihre Entwicklungen zusammengeführt und danach an den Vorstand reportet
   - Makroindikatoren (ca. 50 Indikatoren) als wesentliche Indikatoren, insgesamt etwa 100 Indikatoren. Von besonderem Interesse:
     - Ländersteckbriefe
     - Regulatorische Veränderungen
     - Sondersteuern (siehe Finanzkrise)
     - Faktoren, die sich direkt auf den Konsum auswirken

2. Wie hat sich dieses Thema durch die Finanz- und Wirtschaftskrise 2008/2009 entwickelt und welche Anpassungen gab es?
   - Vor Krise: Fokus auf Anforderungen des KontraG
   - In/nach Krise: Deutlicher Schub an Bedeutung per se und Transfer von KonTraG-Erfüllung zur strategischen Früherkennung (Unterstützung unternehmerischer Entscheidungen mit Aussagen zu zukünftigen Chancen und Risiken, Fokus aber eindeutig Risiken).

3. Wird die strategische Früherkennung als Dienstleistungsprozess der Konzernzentrale an die operativen Einheiten aufgefasst oder welche Selbstauffassung haben Sie?
   - Dienstleistung für den CFO (und den Rest des Vorstands als Informations- und Steuerungsinstrument)
   - Teile des Risikocockpits werden operativen Einheiten zur Verfügung gestellt, erkennen Mehrwert an

4. Welche Fachbereiche in der Konzernzentrale und welche operativen Einheiten verantworten die strategische Früherkennung in Ihrem Unternehmen (bei einem Partner verteilt sich diese Aktivität auf verschiedene Konzernabteilungen (Controlling und Strategie) sowie Business Areas)?
   - In allen operativen Bereichen (dezentrales Risikomanangement) und anderen zentralen Fachabteilungen gibt es direkte Ansprechpartner, die insbesondere als Experten in der Interpretation der Frühindikatoren und ihre Entwicklungen mit einbezogen werden. Horizontale und vertikale Expertengespräche sind im Rahmen der Informationsinterpretation sehr wichtig, weniger komplexe IT-gestützte Auswertungen
   - Dotted line-Prinzip: Fachliche Verantwortung der strategischen Früherkennung liegt bei der zentralen Abteilung

5. Existiert ein standardisierter Prozess der Früherkennung mit IT-Unterstützung oder wird diese eher „ad hoc“ für gewisse Größenordnungen (Eintrittswahrscheinlichkeit, Schadenspotential) ausgeführt?
   - Der Fokus der IT-Unterstützung liegt bei der Auswertung (Konsolidierung von Informationen, Erstellen von Korrelationen, Jahresscheiben, Szenarien etc) und wird durch eine Eigenentwicklung durch T-Systems („RiskAT“) abgedeckt. Segmente und Länder können verglichen werden
   - Lösung existiert seit 7-8 Jahren. Integrierte SAP-Produkte waren damals noch nicht in gewünschtem Umfang verfügbar. Eigene Datenhaltung, Wenn-dann-Simulationen sind möglich
   - Das Reporting wird über ein Reporting Booklet („Riskcockpit“) für den Vorstand gestaltet ist.

1 Evaluation (45 Min)

Zur Beurteilung Ihres Früherkennungssystems legen wir eine fünfstufige Likertskala zugrunde sowohl für den IST als auch für den SOLL-Wert zu Grunde. Bitte beurteilen Sie wie folgt: „1“: sehr gering, „2“: gering, „3“: neutral, „4“: hoch, „5“: sehr hoch

1.1 Informationssammlung (10 Min)

1. In welchem Maße ist Ihr Früherkennungssystem auf *strategische Risiken* ausgerichtet (? Wie werden diese erfasst? Berücksichtigen Sie auch schwache Signale wie Tendenzen, Stimmungen, etc?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
4	**5**	• Hohe Reife im makroökonomischen Bereich (vgl. Abbildung) • Verbesserungspotential bei Operationalisierung erarbeiteter Szenarien (z.B. Griechenland, Schuldenkrise => Auswirkungen auf Banken => Realwirtschaft => Kunden und entsprechende Rückkopplungseffekte. Hierbei wird keine Aggregation der Auswirkung auf eine Größe (EBITDA at Risk), sondern auf ein Portfolio an Steuerungsgrößen (u.a. aus P&L angestrebt) • Schwache Signale wie Stimmungen werden durch Expertengespräche aufgenommen und dokumentiert o Konjunkturelle Vorhersagen werden durch Expertengespräche mit Banken aufgenommen und qualitativ als Kommentierung zu Kennzahlen vermerkt. o Ähnlich ist es bei möglichen regulatorischen Veränderungen, Stimmungen werden schon vor einem Referentenentwurf erfasst. o Schwache Signale werden auch in den Segmenten erfasst, die Kommentierungen zu segmentbezogenen Entwicklungen abgeben

2. In welchem Maße ist Ihr Früherkennungssystem auf *operationale Risiken* ausgerichtet? Wie werden diese erfasst? Berücksichtigen Sie auch schwache Signale?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
3	**4-5**	• Operationale Risiken beziehen sich vor allem auf das Endkundengeschäft (z.B. Zahlungsausfall) • Verbesserungspotential wird in einer besseren Einschätzung schwacher Signale auf das operative Geschäft angestrebt (z.B. Welche Auswirkung hat der Anstieg der Sparquote auf das operative Geschäft)

3. Deckt ihr System maßgebliche *regulatorische Anforderungen* wie Gesetz zur Kontrolle und Transparenz im Unternehmensbereich (KonTraG), IFRS 1 „foreseeable future of at least one year“ oder SOX Section 404 „documentation of internal controls“ ab?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
5	**5**	• Für die Abdeckung regulatorischer Anforderungen („internal controls“) ist Finanz-/ReWe zuständig. Aber inhaltlich läuft RM/Früherkennung bei CFO zusammen • Darüber hinaus wurde in den letzten Jahren sehr viel in diese Richtung unternommen und eine vollständige Abdeckung ist momentan erreicht

4. Werden neben Risiken auch *Chancen* gleichberechtigt berücksichtigt?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
3-4	**4**	• In der Erfassung der Risiken werden Bandbreiten zugelassen, die natürlich auch in eine positive Richtung gehen können(Chancen und Risiken) • Chancen werden auch berücksichtigt; wenn sie für die Planung wesentlich sind, sie werden nicht im RM/Früherkennung erfasst, wenn Sie nichts mit dem Geschäft zu tun haben.

5. Existiert eine *IS-Unterstützung*, um die Intensität und die Geschwindigkeit Ihrer Informationssammlung zu steigern?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
2	**2**	• Expertengespräche zur Informationssammlung sind wichtiger als IT-Unterstützung. Kein Einsatz neuronaler Netze, Künstliche Intelligenz etc. • Im Umfeld der IT und der Netztechnik wird es eingesetzt

1.2 Informationsinterpretation (10 Min)

6. Die Interpretation von Informationen ist ein subjektiver Prozess. Persönliche Unzulänglichkeiten und Vorurteile können die Deutung der Indikatoren beeinflussen. Wird dieser Aspekt in Ihrem System durch *definierte Vorgehensweisen* vermieden?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
4	**4**	• Heuristiken auf der Grundlage von Expertengesprächen dominieren den Prozess der strategischen Früherkennung (keine komplexen mathematischen Modelle mit Vielzahl an Prämissen) Diskussion steht bei der Informationsinterpretation im Vordergrund nicht die mathematische Exaktheit und Komplexität • Deutung der Indikatoren kommt von der jeweiligen Fachabteilung, die sich diesbezüglich besser auskennt. RM/Früherkennung kombiniert die Entwicklungen der Indikatoren und zieht übergreifende Schlüsse

7. Die Interpretation der Indikatoren ist oft schwierig und zeitaufwendig. Dieser Prozess sollte daher Erfahrungen im Sinne von *Wirkungsketten* oder das Wissen aus vergangenen Entscheidungen berücksichtigen. Inwieweit wird dieser Prozess von Ihrem Systems abgedeckt?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
3	**4**	• Das Früherkennungssystem lässt viel Freiraum zum Einbringen von Erfahrungen, da es kein automatisches System ist, das auf Knopfdruck eine Beurteilung erzeugt, sondern diese durch Diskussionen dokumentiert und synthetisiert • Erfahrungen kommen insbesondere durch Fachabteilungen in die Interpretation, deren Mitarbeiter schon länger im Unternehmen sind (z.B. Die aktuelle Lage in Griechenland wird auf Analogien zu Situationen in Japan verglichen, weil Mitarbeiter über die Erfahrung verfügen)

8. Durch welche Methoden wird die *Analyse der Indikatoren* unterstützt? Sind z. B. Data Mining Technologien oder anderer Algorithmen vorhanden, um Zusammenhänge zwischen Indikatoren und finanziellen Kennzahlen herauszuarbeiten?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
2	**3**	• Erneut keine größere Unterstützung der Analyse durch IT, da die inhaltliche Diskussion im Vordergrund steht. Einzig Korrelationsanalysen werden eingesetzt um Zusammenhänge festzustellen

1.3 Informationsnutzung (10 Min)

9. Wie würden Sie die *Informationsdarstellung* Ihres Systems bewerten? Wie ist das Feedback der Führungskräfte und der Fachabteilung?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
5	**5**	• System ist auf die Bedürfnisse des CFO ausgerichtet und erfüllt diese in hohem Maße. Zusammenstellung von wesentlichen Indikatoren im „Riskcockpit" für Führungskräfte und mit Blick auf EBITDA at risk. Dies erfolgt nach Wunsch und Aktualität. • Das „Riskcockpit" ist ein Booklet, das als Cockpit über Indikatoren sowohl auf wesentliche Zusammenhänge auf einem hohen Aggregationsniveau eingeht, aber auch eine hohe Detailtiefe ermöglicht und die Komplexität des Unternehmens aufzeigt.

10. Wie würden Sie die *Navigationsfreundlichkeit* innerhalb Ihres Systems bewerten? Wie ist das Feedback der Führungskräfte und der Fachabteilung?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
4	**4**	• Reiter zur Navigation zwischen den aktuellen und wichtigen Themen • Darstellung wird als gut empfunden und diese Navigationselemente werden intensiv genutzt

11. Gibt es innerhalb Ihres Systems *Kommunikationsfunktionalitäten*? Ist es Ihnen beispielsweise möglich aus dem System heraus eine Anfrage an eine betreffende Person per Email, Kurznachricht oder persönlichem Gespräch zu stellen?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
2	**2**	• Kommunikationsfunktionen sind nicht relevant, da exklusive Informationen, die speziell für den Vorstand aufbereitet werden und nicht mit anderen ausgetauscht werden sollen. Prinzipiell ist es möglich, Screenshots und ppt. zu versenden

12. Über die genannten Punkte 9 bis 11 hinaus, wie schätzen sie die *nutzerfreundliche* Verwendung der gesammelten und interpretierten Informationen sicher? Wie gehen Sie dabei mit historischen Informationen um?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
4	**4**	• Veränderung der Prognose zu vergangenen Zeitintervallen wird über 2 Jahre erfasst, Blick in die Zukunft wichtiger als Blick in Vergangenheit

1.4 Prozessübergreifende Aspekte (10 Min)

13. Wie zeitnah erfasst, verarbeitet und stellt Ihr System mögliche Chancen und Risiken Ihnen zur Verfügung? Ist dies für alle Beobachtungsbereiche gleich oder gibt es dort Unterschiede?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
3	**4**	• Gesamter Erfassungsprozess ist relativ zeitintensiv durch Abstimmungs- und Diskussionsrunden in den Expertengesprächen • Daten sind quartalsweise zur Veröffentlichung aktuell. Wichtige Themen werden darüber hinaus „ad-hoc" aktualisiert

14. Wie *flexibel* kann Ihr System auf Veränderungen in Ihrer Aufgabenstellung wie z. B. neue Beobachtungsbereiche oder Frühindikatoren reagieren?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
3	**4**	• System ist sehr flexibel, da es sich bei dem Reportingtool um ein PowerPoint-Instrument handelt. • Neue Indikatoren können daher einfach aufgenommen werden. • Feedbackschleifen werden regelmäßig durch RM/Früherkennung durchgeführt und sorgen für hohe Relevanz der Inhalte.

15. Wie *genau* (Vorlaufzeit, Eintrittswahrscheinlichkeit, Schadenspotential, sowie Indikatordaten insgesamt) sind die Informationen, die Ihnen bereitgestellt werden? Legen Sie mehr Wert auf den Gesamtzusammenhang oder steht die Genauigkeit einzelner Angaben im Vordergrund?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
4	**4**	• Zweigeteilte Vorgehensweise die sowohl auf eine genaue Einschätzung als auch auf einen qualitativen Gesamtzusammenhang abzielt: o Themen werden bereits adressiert, wenn sie noch nicht quantifizierbar sind (z.B. Politische Diskussionen vor Referentenentwürfen, schwaches Signal -> Keine Bewertung möglich (1. Stufe) o Sobald die Entwicklung konkreter wird (z.B. Referentenentwurf), werden die Daten quantifiziert

16. Wie schätzen Sie die *Zuverlässigkeit* ihres Systems im Sinne einer Vermeidung von Manipulationen, Störungen und technischer Fehler?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
4	**4**	• Das Reportingsystem ist seit 10 Jahren im Einsatz. System und Prozess laufen seitdem zuverlässig. Zusätzlich wurde das System durch das „Riskcockpit" erweitert. • „RiskAT" dient zur Durchführung von Korrelationsanalysen und Aggregation der Risiken

17. Inwieweit werden unternehmensübergreifend wie Lieferanten, Kunden, Forschungspartner etc. in Ihrem System integriert? Gibt es Kooperationen zur Sammlung, Interpretation und oder Nutzung von Informationen?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
3	**4**	• Im engeren Sinne handelt es sich um ein geschlossenes System, welches vor allem empfindliche Informationen nicht an Externe ausgibt. • Im weiteren Sinne werden zur Interpretation externe Partner befragt und somit integriert. Banken werden zur Beurteilung von makroökonomischen Entwicklungne befragt und die Fachabteilungen (Lieferanten, Kunden etc) stehen in engem Kontakt zu anderen Partnern

18. Inwieweit sind IT-gestützte *Validierungsprüfungen* innerhalb ihres Systems vorhanden? Gibt es darüber hinaus Maßnahmen, die die Transparenz des Systems steigern sollen? (Prozessdarstellungen etc.) Wie sind Wirtschaftsprüfer einbezogen, liegt ggb. eine Zertifizierung vor?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
5	5	• Zur Erfüllung von KonTraG bereits vorgeschrieben und daher als transparentes System gestaltet.

1.5 Aufwand (5 Min)

19. Welche *Kosten* sind bei der Entwicklung des Früherkennungssystems entstanden und was sind in etwa die Kosten des laufenden Betriebs (Anzahl Mitarbeiter, Software, Hardware)?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
		• 8 Mitarbeiter für Risikomanagement • Entwicklung erfolgte intern neben dem Tagesgeschäft • Die genutzte Software („RiskAT“) wurde ebenfalls hausintern entwickelt

20. Wie hoch war die Zeit, die zur Konzeption und Implementierung des IS aufgewendet wurde und wie ist der laufende Zeitbedarf der Pflege (Verhältnis zwischen Zeitaufwand und Nutzen)?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
		• Es handelt sich insgesamt um einen kontinuierlichen Verbesserungsprozess, in dem das System immer wieder neu an Veränderungen angepasst wird. Themen werden immer wieder bezüglich ihrer Aktualität und Relevanz geprüft.

2 Weitergehende Anmerkungen

Das Unternehmen beobachtet im Bezug auf das makroökonomische Umfeld in etwa 50 und in Summe über alle Beobachtungsfelder in etwa 100 Indikatoren. Gerade das erstere steht somit im besonderen Fokus. Es werden zudem länderspezifische Analysen durchgeführt.

Im Bezug auf Kunden steht alles im Fokus, was sich negativ auf den Konsum auswirken könnte (z.B. Steuern).

Für den Interviewpartner sind zukünftig folgende Fragestellungen von besonderem Interesse:

- Inwieweit wird die aktuelle (Schulden-)Krise analysiert und welche Szenarien werden daraus abgeleitet mit welchen Implikationen für die Unternehmen näher betrachtet?
- Wieviel Prozent der erhobenen Information werden auch tasächlich verarbeitet und genutzt und wieviel Prozent landen auf einem „Datenfriedhof“?
- Inwieweit findet bei anderen Unternehmen eine IS-Unterstützung statt, in welchen Bereichen (Informationsgenerierung, Informationsanalyse und/oder Informationsdarstellung) und wie helfen diese während des Prozesses.

Company C

Institut für Wirtschaftsinformatik

Universität St.Gallen

1 Grundlagen (15 Min)

1. Welche Rolle (Bedeutung und Aufgaben) hat die strategische Früherkennung in Ihrem Unternehmen?

   - Angesichts der sehr unterschiedlichen Geschäftsmodelle in den verschiedenen Business Groups existiert zwar auf Konzernebene ein Risikocontrolling zur Erfüllung legaler Anforderungen. Darüber hinaus sind die einzelnen Business Groups jedoch weitgehend unabhängig und behandeln das Thema strategische Früherkennung völlig eigenständig.
   - Angesichts der vergangenen Wirtschaftskrise und der enormen Schwankungen am Markt hat das Thema eine hohe Bedeutung.

2. Wie hat sich dieses Thema durch die Finanz- und Wirtschaftskrise 2008/2009 entwickelt und welche Anpassungen gab es?
   - Durch die genannte Krise ist das Thema in den Fokus gerückt; tagesaktuelles Monitoring ausgewählter FEI wurde während der Krise durchgeführt.
   - Angesichts der Ereignisse im Sommer 2011 und der sich andeutenden nächsten Krise rückt dieses Thema nun wieder in den Fokus. Auf Konzernebene soll nun eine Standardisierung der strategischen Früherkennung und eine Unterstützung der Business Groups vorgenommen werden

3. Wird die strategische Früherkennung als Dienstleistungsprozess der Konzernzentrale an die operativen Einheiten aufgefasst oder welche Selbstauffassung haben Sie?
   - Nein, derzeit keine Dienstleistungsfunktion/ -situation. Aufgrund der heterogenen Geschäftsmodelle der Unternehmensbereiche vermutlich auch für die Zukunft nicht zentral in Hohem Maße vorgegeben.
   - Von zentraler Seite sollen nun Vorgaben an die Früherkennung festgelegt werden.
     - Dies werden keine Vorschriften über Indikatoren sein als vielmehr ein zentraler Prozess mit IS-Unterstützung um die gewonnenen Daten einzusammeln, aufzubereiten und für die Konzernführung und Business Group Führung zentral zur Verfügung zu stellen.
     - Es wird geschätzt, dass ca. 20% der Indikatoren nicht geschäftsspezifisch sind und daher auch zentral zur Verfügung gestellt werden könnten.

4. Welche Fachbereiche in der Konzernzentrale und welche operativen Einheiten verantworten in Ihrem Unternehmen die strategische Früherkennung (verschiedene Konzernabteilungen und operative Einheiten)?
   - Derzeit liegt das Thema in Verantwortung des Managements der eigenständigen Unternehmensbereiche (ohne wesentlichen Anteil von Konzernabteilungen).
   - Zukünftig siehe 3

5. Welche Bedeutung kommt der IT-Unterstützung zu? Existiert ein standardisierter Prozess der Früherkennung oder wird diese eher „ad hoc“ und informell je Eintrittswahrscheinlichkeit, Schadenspotential ausgeführt?
   - Je Unternehmensbereich unterschiedlich ausgeprägt: teilweise hoch professionell; teilweise nur rudimentär (IT-Unterstützung jedoch kaum / nicht gegeben)
   - In Zukunft soll dies über eine integrierte BI-Lösung abgedeckt werden

2 Evaluation (45 Min)

Zur Beurteilung Ihres Früherkennungssystems legen wir eine fünfstufige Likertskala zugrunde; das sowohl für Ihre IST- als auch Ihre SOLL-Beurteilung. Bitte beurteilen Sie wie folgt: „1“: sehr gering, „2“: gering, „3“: neutral, „4“: hoch, „5“: sehr hoch

2.1 Informationssammlung

1. In welchem Maße ist Ihr Früherkennungssystem auf *strategische Risiken* ausgerichtet? Wie werden diese erfasst? Berücksichtigen Sie auch schwache Signale wie Tendenzen, Stimmungen, etc?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
3	**4**	• Insbesondere die Unternehmensbereiche in sensitiven, zyklischen Märkten (Halbleiter) berücksichtigen strategische Risiken. Sie besitzen institutionalisierte Früherkennungssysteme und weisen einen hohen Analysegrad auf. • In einigen Bereichen gibt es aber auch noch Verbesserungspotentiale.

2. In welchem Maße ist Ihr Früherkennungssystem auf *operationale Risiken* ausgerichtet? Wie werden diese erfasst? Berücksichtigen Sie auch schwache Signale?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
3	**4**	• Überwiegend der Fokus auf operationale Risiken mit bis mittelfristigen Betrachtungshorizont; Inputs aus Konzern IT Systemen. • Schwache Signale werden nicht berücksichtigt. • Als Indikatoren werden bspw. Gartner Forecasts im Bezug auf Halbleiter, Philantrophic Funding, MedTec-Konfidenzindex verwendet. Zusammenhänge dieser Indikatoren werden jedoch nicht analytisch betrachtet. Weder durch Korrelations- noch Szenarioanalysen. • Eine Interpretation erfolgt vor allem durch Kommentare und Bewertungen.

3. Deckt ihr System maßgebliche *regulatorische Anforderungen* wie Gesetz zur Kontrolle und Transparenz im Unternehmensbereich (KonTraG), IFRS 1 „foreseeable future of at least one year“ oder SOX Section 404 „documentation of internal controls“ ab?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
2	**4**	• Aktuelle Risiken werden erfasst und bewertet, müssen aber nicht mit Früherkennungsindikatoren belegt werden. • O.g. Bsp. sowie FDA etc. sind natürlich relevant und im Fokus; jedoch nicht unter „Risikofrüherkennung“ subsumiert.

4. Werden neben Risiken auch *Chancen* gleichberechtigt berücksichtigt?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
4	**4**	• Chancen werden im Rahmen des 5-Quartals-Forecast der rollierenden Planung berücksichtigt. • Bereiche mit guten Früherkennungssystemen können die Informationen nutzen um Planung schon frühzeitig anzupassen. o Bei einem unvorhergesehenen Marktwachstum kann es beispielsweise zu Kapazitätsengpässen kommen. Durch die Anpassung in der Planung können so schon frühzeitig personelle Anpassung durch Leiharbeitsfirmen und Kapazitätserweiterungen vorgenommen werden

5. Existiert eine *IS-Unterstützung* (z. B. Data Mining, semantische Suche, neuronale Netze/ künstliche Intelligenz), um die Intensität und die Geschwindigkeit Ihrer Informationssammlung zu steigern?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
1	**4**	• Momentan wird keine IS-Unterstützung im größeren Maße zur Informationssammlung verwendet • Zukünftige Systeme sollen interne Daten direkt aus dem BW laden und externe Daten durch abonnierte CSV-Dateien automatisch integrieren, um diese dann weiter aufzubereiten.

2.2 Informationsinterpretation

6. Die Interpretation von Informationen ist ein subjektiver Prozess. Persönliche Unzulänglichkeiten und Vorurteile können die Deutung der Indikatoren beeinflussen. Wird dieser Aspekt in Ihrem System durch *definierte Vorgehensweisen* vermieden?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
		• Keine ausreichenden Informationen zur Bewertung. • Einzelne Bereiche haben institutionalisierten Prozess mit Bewertungen von ein oder mehreren Personen.

7. Die Interpretation der Indikatoren ist oft schwierig und zeitaufwendig. Dieser Prozess sollte daher Erfahrungen im Sinne von *Wirkungsketten* oder das Wissen aus vergangenen Entscheidungen berücksichtigen. Inwieweit wird dieser Prozess von Ihrem Systems abgedeckt?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
2	**5**	• Zumindest durch die subjektive Komponente im Prozess, z. T auch durch mehrjährige Zeitreihen der Indikatoren und Messgrößen abgedeckt. • Keine Systematische Erfassung und Darstellung von Wirkungsketten. • In den Business Groups mit ausführlichen Systemen wird dies durch wenige Personen ausgeübt die über eine große persönliche Erfahrung verfügen und daher auch einen Abgleich mit vergangenen Entscheidungen vollziehen können.

8. Durch welche Methoden wird die *Analyse der Indikatoren* unterstützt? Sind z. B. Data Mining, semantische Suche, neuronale Netze/ künstliche Intelligenz oder andere Algorithmen vorhanden, um Zusammenhänge zwischen Indikatoren und finanziellen Kennzahlen herauszuarbeiten? Wie gehen Sie dabei mit historischen Informationen um?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
1	**3**	• Nach Einschätzung des Interviewpartners setzen derartige Methoden ein leistungsfähiges IT System mit Konsistenten Daten voraus, was jedoch derzeit nicht hierfür genutzt wird (SAP BO)

2.3 Informationsnutzung

9. Wie würden Sie die *Informationsdarstellung* Ihres Systems bewerten? Wie ist das Feedback der Führungskräfte und der Fachabteilung?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
1	**5**	o Momentan werden die Informationen in Excel, PowerPoint und Word aufbereitet und den jeweiligen Entscheidungsträgern in den Business Groups zur Verfügung gestellt. o In einem der Bereich werden monatlich die Daten aktualisiert, neue Bewertungen vorgenommen und dem Management zur Verfügung gestellt o Zukünftig sollen in einer integrierten BI Lösung mit Berechtigungskonzept und unter Berücksichtigung des BSC Gedankens die Informationen personenbezogen und mit graphischer Aufarbeitung zur Verfügung gestellt werden.

10. Wie würden Sie die *Navigationsfreundlichkeit* innerhalb Ihres Systems bewerten? Wie ist das Feedback der Führungskräfte und der Fachabteilung?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
1	**5**	• Bisher lediglich inaktive PowerPoint Darstellung mit einer unvollständigen Liste an Indikatoren • Zukünftige BI-Lösung sollte SAP basiert sein und einen Absprung in Vorsysteme sowie eine individuelle Navigation durch verschiedene Stufen der Aggregation ermöglichen • Der Zugriff auf historische Daten soll ebenfalls aus dem System heraus möglich sein

11. Gibt es innerhalb Ihres Systems *Kommunikationsfunktionalitäten*? Ist es Ihnen beispielsweise möglich aus dem System heraus eine Anfrage an eine betreffende Person per Email, Kurznachricht oder persönlichem Gespräch zu stellen?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
1	**5**	• Momentan nicht vorhanden • Zukünftige Lösung könnte auf SAP Excelsius basieren und damit die dort vorhandenen Standardfunktionalitäten (z.B. Kommentarfunktion mit Bitte um Rückmeldung) zur Verfügung stellen. • Diese sollten in einem zukünftigen Prozess berücksichtigt werden, in dem Experten per Nachricht zu einer Beurteilung aufgefordert werden und danach auch für Rückfragen wieder kontaktierbar sind.

12. Über die genannten Punkte 9 bis 11 hinaus, wie schätzen sie die *nutzerfreundliche* Verwendung der gesammelten und interpretierten Informationen mit Hilfe der IT-Unterstützung ein?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
1	**5**	• Generell ist hier ein erheblicher Ausbau durch eine integrierte BI-Lösung angestrebt.

2.4 Prozessübergreifende Aspekte

13. Wie zeitnah erfasst, verarbeitet und stellt Ihr System mögliche Chancen und Risiken Ihnen zur Verfügung? Ist dies für alle Beobachtungsbereiche gleich oder gibt es dort Unterschiede?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
3	**5**	• Momentan werden ein paar Früherkenungsindikatoren monatlich oder zweimonatlich erfasst. Interne Indikatoren, die auch als Kennzahlen fungieren (Auftragseingänge) werden sogar täglich erfasst. • Zukünftig sollen die Daten indikatorabhängig täglich bis wöchentlich erfasst werden um diese noch zeitnäher zur Verfügung zu stellen.

14. Wie *flexibel* kann Ihr System auf Veränderungen in Ihrer Aufgabenstellung wie z. B. neue Beobachtungsbereiche oder Frühindikatoren reagieren?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
4	**3**	• Durch die manuelle Erstellung und Pflege ist das System momentan sehr flexibel • Diese Flexibilität wird in einer zukünftigen BI-Lösung geringer ausfallen.

15. Wie *genau* (Vorlaufzeit, Eintrittswahrscheinlichkeit, Schadenspotential, sowie Indikatordaten insgesamt) sind die Informationen, die Ihnen bereitgestellt werden? Legen Sie mehr Wert auf den Gesamtzusammenhang oder steht die Genauigkeit einzelner Angaben im Vordergrund?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
3	**4**	• Tendenz steht im Fokus (80% Genauigkeit ist ausreichend) • Eine Verbesserung der Genauigkeit wird dennoch als möglich angesehen.

16. Wie schätzen Sie die *Zuverlässigkeit* ihres Systems im Sinne einer Vermeidung von Manipulationen, Störungen und technischer Fehler? Wie ist die Abstimmung mit Wirtschaftsprüfern, gar eine Zertifizierung?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
3	**3**	• Wenige benannte und vertrauenswürdige Personen stellen das „System" dar (allerdings hohe Abhängigkeit von einzelnen Knowhow Trägern) • Momentan sind technische Fehler ausgeschlossen jedoch werden diese zukünftig in einer integrierten BI-Lösung zunehmen. Es wird jedoch angenommen, dass diese in gleichem Maße die Eingabeungenauigkeit reduziert, sodass man insgesamt von einer gleichbleibenden Zuverlässigkeit ausgehen kann.

17. Inwieweit werden unternehmensübergreifend Partner wie Lieferanten, Kunden, aber auch Forschungspartner, kreditgebende Banken und Ratingagenturen etc. in Ihrem System integriert? Gibt es Kooperationen zur Sammlung, Interpretation und oder Nutzung von Informationen?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
1	**3**	• Unternehmensbereichs-übergreifend mit Blick auf die gesamte Gruppe ist ein professioneller, konsistenter Prozess dringend erforderlich • Momentan findet ein solcher Austausch unternehmensübergreifend nicht statt. Ob ein offener, aktiver Dialog mit externen Partnern sinnvoll ist hängt von den Geschäftsmodellen der einzelnen Business Groups ab und ist zurzeit vom Interviewpartner nicht zu beurteilen.

18. Inwieweit sind IT-gestützte Validierungsprüfungen innerhalb ihres Systems vorhanden? Gibt es darüber hinaus Maßnahmen, die die Transparenz des Systems steigern sollen? (Prozessdarstellungen etc.)

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
1	**5**	• Keine IT Unterstützung • Eine Verbesserung wird zukünftig in einer Prozessdokumentation mit Indikatorsteckbriefen gesehen

2.5 Aufwand

19. Welche *Kosten* sind bei der Entwicklung des Früherkennungssystems entstanden und was sind in etwa die Kosten des laufenden Betriebs (Anzahl Mitarbeiter, Software, Hardware)?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
		• Dezentral und unbekannt

20. Wie hoch war die Zeit, die zur Konzeption und Implementierung des IS aufgewendet wurde und wie ist der laufende Zeitbedarf der Pflege (Verhältnis zwischen Zeitaufwand und Nutzen)?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
		• Dezentral und unbekannt

Company D

Institut für Wirtschaftsinformatik

Universität St.Gallen

1 Grundlagen (15 Min)

1. Welche Rolle (Bedeutung und Aufgaben) hat die strategische Früherkennung in Ihrem Unternehmen?

   - Generell gibt es eine Unterscheidung zwischen Risikofrüherkennung und „Business" Früherkennung
   - Business Früherkennung ist eher auf Chancen ausgerichtete und wird auf dezentraler Ebene durchgeführt. Hierbei besteht die Frage zur zukünftigen Ausrichtung des Geschäfts.
   - Die Risikofrüherkennung wird in einem zentralen systematischen Prozess durchgeführt („Shield"). Es werden zwei Sichtweisen betrachtet, eine interne und eine externe Sichtweise
     - Extern werden Marktindikatoren (2-5 Marktindikatoren je Markt) erfasst und mithilfe von vorbestimmten Toleranzniveaus ausgewertet. Ihre Auswirkung auf finanzielle Kennzahlen sind zuvor mit Korrelationsanalysen bestimmt worden
     - Intern werden Szenarien für die finanziellen Kennzahlen aufgestellt (Umsatz und andere Kennzahlen wie EBIT (grün, gelb und rot in einer Matrix).
     - Für jedes Feld der Matrix bestehen vordefinierte Maßnahmen (z.B. die Einführung von Kurzarbeit), die entsprechend der Position ausgelöst werden

2. Wie hat sich dieses Thema durch die Finanz- und Wirtschaftskrise 2008/2009 entwickelt und welche Anpassungen gab es?
   - Das gesamte Thema wurde im Zuge der Wirtschaftskrise ausgelöst und verstärkt verfolgt. In diesem Rahmen wurde das zentrale System zur Risikofrüherkennung konzipiert und umgesetzt.

3. Wird die strategische Früherkennung als Dienstleistungsprozess der Konzernzentrale an die operativen Einheiten aufgefasst oder welche Selbstauffassung haben Sie?
   - Das System stellt ein zentrales Steuerungsinstrument dar, baut jedoch auf eine dezentrale Kooperation und Umsetzung der Maßnahmen. Folglich ist es ein Dienstleistungsprozess der aber auch auf Beteiligung baut
   - Zusätzlich werden die Informationen dem Vorstand mindestens jährlich vorgestellt

4. Welche Fachbereiche in der Konzernzentrale und welche operativen Einheiten verantworten in Ihrem Unternehmen die strategische Früherkennung (verschiedene Konzernabteilungen und operative Einheiten)?
   - Steuerung erfolgt durch zwei zentrale Fachabteilungen Controlling sowie Strategie- und Finanzanalyse.
   - Die Erfassung externer Faktoren und die Definition der internen Szenarien erfolgt zentral. Letztere werden mit den Business Bereichen abgestimmt. Maßnahmen werden in den dezentralen Geschäftsbereichen und dort meist über die Controllingeinheiten festgelegt.
   - Es gibt eine eigene RM und Compliance Einheit, die aber nicht alle RM Aufgaben übernimmt.

5. Welche Bedeutung kommt der IT-Unterstützung zu? Existiert ein standardisierter Prozess der Früherkennung oder wird diese eher „ad hoc" und informell je Eintrittswahrscheinlichkeit, Schadenspotential ausgeführt?
   - Ein standardisierter, zentraler Prozess existiert. Die IT-Unterstützung ist dabei aber eher gering.
   - Umsetzung des Risikofrüherkennungssystems existiert in Excel/PowerPoint aus Gründen der Einfachheit und Handhabbarkeit.
   - Die Indikatoren werden in Excel anhand von Schwellwerten ausgewertet.

2 Evaluation (45 Min)

Zur Beurteilung Ihres Früherkennungssystems legen wir eine fünfstufige Likertskala zugrunde; das sowohl für Ihre IST- als auch Ihre SOLL-Beurteilung. Bitte beurteilen Sie wie folgt: „1“: sehr gering, „2“: gering, „3“: neutral, „4“: hoch, „5“: sehr hoch

2.1 Informationssammlung

1. In welchem Maße ist Ihr Früherkennungssystem auf *strategische Risiken* ausgerichtet? Wie werden diese erfasst? Berücksichtigen Sie auch schwache Signale wie Tendenzen, Stimmungen, etc?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
2	**3**	• Das System ist ein rein quantitativ. Qualitative Aussagen sind nicht vorgesehen. Strategische Ausrichtung wird eher in der dezentralen Business Früherkennung übernommen. • Risikofrüherkennungssystem ist daher sehr operativ in seiner Ausrichtung. Strategische Aspekte durch schwache Signale (Auftreten einer neuen Technologie) werden nicht betrachtet.

2. In welchem Maße ist Ihr Früherkennungssystem auf *operationale Risiken* ausgerichtet? Wie werden diese erfasst? Berücksichtigen Sie auch schwache Signale?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
4	**3**	• Es herrscht eine stark operative Ausrichtung. Schwache Signale werden nicht berücksichtigt. • System ist momentan zu operativ ausgerichtet und sollte deshalb mehr auf strategische Aspekte und damit eher auf einen langfristigeren Fokus abzielen.

3. Deckt ihr System maßgebliche *regulatorische Anforderungen* wie Gesetz zur Kontrolle und Transparenz im Unternehmensbereich (KonTraG), IFRS 1 „foreseeable future of at least one year“ oder SOX Section 404 „documentation of internal controls“ ab?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
4	**4**	• Anforderungen sind erfüllt jedoch nicht alleine von dem Risikofrüherkennungssystem. Regulatorische Anforderungen sind auch nicht dessen Fokus. • Risikoinventar wird unabhängig erstellt. Informationen aus dem Risikofrüherkennungssystem sind dafür ausreichend.

4. Werden neben Risiken auch *Chancen* gleichberechtigt berücksichtigt?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
1	**2**	• Das System ist rein risikoorientiert. Dezentral werden Chancen berücksichtigt. • Eine Verbesserung wird in einer möglichen Integration von Chancen gesehen.

5. Existiert eine *IS-Unterstützung* (z. B. Data Mining, semantische Suche, neuronale Netze/ künstliche Intelligenz), um die Intensität und die Geschwindigkeit Ihrer Informationssammlung zu steigern?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
1	**1**	• Solche Systeme werden nicht eingesetzt. Eine Einführung ist nicht vorgesehen. • Im Unternehmen würde eine solche Erweiterung als zu komplex angesehen werden und keinen Rückhalt erfahren. Deshalb gibt es keine Bestrebungen das System in der angesprochenen Form zu erweitern

2.2 Informationsinterpretation

6. Die Interpretation von Informationen ist ein subjektiver Prozess. Persönliche Unzulänglichkeiten und Vorurteile können die Deutung der Indikatoren beeinflussen. Wird dieser Aspekt in Ihrem System durch *definierte Vorgehensweisen* vermieden?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
4	**5**	• Interpretation soll komplett objektiv erfolgen und wenig bis keinen Spielraum für subjektive Meinungen belassen. • Aktuell ist das System vorurteilsfrei einsetzbar. Nur bei der Definition von Maßnahmen werden Diskussionen geführt und eigene Meinungen der Betroffenen Einheiten berücksichtigt. Die Interpretation der Indikatoren ist vollständig automatisiert und das Auslösen von Maßnahmen direkt daran gebunden. • An allen Stellen sind manuelle Eingriffe möglich und Abweichungen vom automatischen Mechanismus können vorgenommen werden.

7. Die Interpretation der Indikatoren ist oft schwierig und zeitaufwendig. Dieser Prozess sollte daher Erfahrungen im Sinne von *Wirkungsketten* oder das Wissen aus vergangenen Entscheidungen berücksichtigen. Inwieweit wird dieser Prozess von Ihrem Systems abgedeckt?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
4	**4**	• Wirkungsketten wurden umfassend bei der Konzeption des Systems durch statistische Methoden identifiziert. Diese fließen auch in die Entscheidungsfindung ein. • Vergangene Handlungen werden nicht berücksichtigt.

8. Durch welche Methoden wird die *Analyse der Indikatoren* unterstützt? Sind z. B. Data Mining, semantische Suche, neuronale Netze/ künstliche Intelligenz oder andere Algorithmen vorhanden, um Zusammenhänge zwischen Indikatoren und finanziellen Kennzahlen herauszuarbeiten? Wie gehen Sie dabei mit historischen Informationen um?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
1	**1**	• Solche Analysen finden bei der Auswahl der Indikatoren Anwendung, aber nicht bei deren Auswertung. Aktuell gibt es Überlegungen die Indikatoren in regelmäßigen Abständen (alle 1-2 Jahre) zu aktualisieren und zu überprüfen ob die Wirkungszusammenhänge noch immer bestehen. • Bei der Interpretation werden keine weiteren Analysenmechanismen verwendet.

2.3 Informationsnutzung

9. Wie würden Sie die *Informationsdarstellung* Ihres Systems bewerten? Wie ist das Feedback der Führungskräfte und der Fachabteilung?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
4	**4**	• Das Reporting erfolgt in PowerPoint und wird von der zentralen Abteilung erstellt. Rückmeldungen sind generell positiv. Akzeptanz wäre noch zu verbessern, wird aber nicht als erforderlich eingeschätzt. • 3 interne Szenarien anhand EBIT etc. 5 externe Markt-Krisenstufen (+2 bis -2). Daraus ergibt sich eine Matrix mit 12 Feldern, die den Bereichen grün, gelb und rot zugeordnet sind. Je nach Farbe werden Maßnahmen ausgelöst. • Adressaten: o Ergebnisse (Szenarien) werden dem Vorstand 1 mal im Jahr vorgestellt. In Krisenfällen findet dies auch häufiger statt. o Segmente werden nur quartalsweise informiert, wenn sich Handlungsbedarf ergibt bzw. die Situation kritisch wird. Tatsächlich wird eine vollständige Analyse erst ausgelöst, wenn sich Probleme abzeichnen.

10. Wie würden Sie die *Navigationsfreundlichkeit* innerhalb Ihres Systems bewerten? Wie ist das Feedback der Führungskräfte und der Fachabteilung?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
3	**3**	• Navigation in PowerPoint-Dokument erfolgt eindimensional. • System ist jedoch einfach strukturiert und erfordert keine größeren Navigationsmöglichkeiten. Es existieren keine komplexen Aggregationsformen, in denen man sich zu den Detailinformationen „durchklicken" müsste.

11. Gibt es innerhalb Ihres Systems *Kommunikationsfunktionalitäten*? Ist es Ihnen beispielsweise möglich aus dem System heraus eine Anfrage an eine betreffende Person per Email, Kurznachricht oder persönlichem Gespräch zu stellen?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
1	**1**	• Nicht vorhanden wird aber auch nicht benötigt • Erfahrungen aus anderen Systemen im Unternehmen zeigen, dass diese auch nicht angewendet werden.

12. Über die genannten Punkte 9 bis 11 hinaus, wie schätzen sie die *nutzerfreundliche* Verwendung der gesammelten und interpretierten Informationen mit Hilfe der IT-Unterstützung ein?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
4	**3**	• Zweck wird erfüllt und eine hohe Zufriedenheit erreicht. Dabei werden keine besonderen Features benötigt. • Die Benutzerfreundlichkeit ist momentan sehr gut. Verbesserung wird in der Reduktion der Benutzerfreundlichkeit zu Gunsten einer größeren Komplexität und besserer Funktionalität gesehen

2.4 Prozessübergreifende Aspekte

13. Wie zeitnah erfasst, verarbeitet und stellt Ihr System mögliche Chancen und Risiken Ihnen zur Verfügung? Ist dies für alle Beobachtungsbereiche gleich oder gibt es dort Unterschiede?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
4	**4**	• Die Analyse der Indikatoren erfolgt quartalsweise. • Reproting erfolgt jährlich und nur bei Gefahrensituationen oder Lageverschlechterungen quartalsweise.

14. Wie *flexibel* kann Ihr System auf Veränderungen in Ihrer Aufgabenstellung wie z. B. neue Beobachtungsbereiche oder Frühindikatoren reagieren?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
3	**4**	• Aufnahme neuer Indikatoren ist prinzipiell sehr einfach und flexibel. • Die Kapazität zur Indikatorenauswahl ist allerdings eingeschränkt. Die initiale Auswahl wurde mit Hilfe von Beratern und anhand komplexer Statistik durchgeführt.

15. Wie *genau* (Vorlaufzeit, Eintrittswahrscheinlichkeit, Schadenspotential, sowie Indikatordaten insgesamt) sind die Informationen, die Ihnen bereitgestellt werden? Legen Sie mehr Wert auf den Gesamtzusammenhang oder steht die Genauigkeit einzelner Angaben im Vordergrund?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
2	**2**	• System ist quantitativ aufgebaut das Ergebnis der Analyse hat jedoch qualitativen Charakter. • Genauigkeit ist nicht so wichtig, denn Entscheidungen sind qualitativ.

16. Wie schätzen Sie die *Zuverlässigkeit* ihres Systems im Sinne einer Vermeidung von Manipulationen, Störungen und technischer Fehler? Wie ist die Abstimmung mit Wirtschaftsprüfern, gar eine Zertifizierung?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
3	**4**	• System wurde bereits von Prüfern testiert. • Politische Einflüsse sind immer gegeben und Indikatoren können im Nachhinein geändert werden. Daher ist die Zuverlässigkeit ist nicht 100 % • Daten werden manuell erfasst. Daher herrscht ein gewisses Fehlerpotential.

17. Inwieweit werden unternehmensübergreifend Partner wie Lieferanten, Kunden, aber auch Forschungspartner, kreditgebende Banken und Ratingagenturen etc. in Ihrem System integriert? Gibt es Kooperationen zur Sammlung, Interpretation und oder Nutzung von Informationen?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
1	**1**	• Keine Integration

18. Inwieweit sind IT-gestützte Validierungsprüfungen innerhalb ihres Systems vorhanden? Gibt es darüber hinaus Maßnahmen, die die Transparenz des Systems steigern sollen? (Prozessdarstellungen etc.)

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
2	**3**	• Standardvalidierungen sind vorhanden. • Tiefere Mechanismen wären sinnvoll. Jedoch stellt dies nicht den Fokus einer weiteren Entwicklung dar.

2.5 Aufwand

19. Welche *Kosten* sind bei der Entwicklung des Früherkennungssystems entstanden und was sind in etwa die Kosten des laufenden Betriebs (Anzahl Mitarbeiter, Software, Hardware)?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
5	**5**	• Einführung erfolgte in einem 3-4 Personen Beratungsprojekt über 6 Monate zzgl. Interner Ressourcen • Operativer Aufwand: max. 0,5 Personen (mittleres Management). Betriebskosten liegen daher bei ca. 50 000 € pro Jahr

20. Wie hoch war die Zeit, die zur Konzeption und Implementierung des IS aufgewendet wurde und wie ist der laufende Zeitbedarf der Pflege (Verhältnis zwischen Zeitaufwand und Nutzen)?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
4	**5**	• Implementierung war zügig. Hätte jedoch noch schneller ablaufen können.

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1 Grundlagen (15 Min)

1. Welche Rolle (Bedeutung und Aufgaben) hat die strategische Früherkennung in Ihrem Unternehmen?
   - Früherkennung hat einen hohen Stellenwert
   - Der Vorstand wird wöchentlich informiert (inkl. Risiken und Chancen). Risk reviews werden monatlich/vierteljährlich in jeder BU und Division durchgeführt
   - Das Board of Directors überprüft die Ergebnisse des Enterprise Risk Managements vierteljährlich.
   - Neben dem Risikomanagement auf Group Level hat auch jede Division ihr eigenen Risiko- und Chancenmanagement
2. Wie hat sich dieses Thema durch die Finanz- und Wirtschaftskrise 2008/2009 entwickelt und welche Anpassungen gab es?
   - Nach der Finanzkrise wurde ein übergreifender Risikomanagementprozess eingeführt (Enterprise-Risk-Management-Prozess in 2009). Dieser wurde unabhängig von der Krise in der indischen Tochtergesellschaft entwickelt. Aufgrund der Vollständigkeit wurde der Prozess im gesamten Konzern übernommen.
   - Kern ist dabei ein höher frequentiertes Reporting der Risikoentwicklung
3. Wird die strategische Früherkennung als Dienstleistungsprozess der Konzernzentrale an die operativen Einheiten aufgefasst oder welche Selbstauffassung haben Sie?
   - Auf Grouplevel sind nur wenige Ressourcen vorhanden. Deshalb kann keine Dienstleistung an Divisionen erfolgen. Auf Group Level (in der Zentrale) erfolgt nur die Top-Management-Unterstützung. Die Divisionen betrachten sich selbst.
4. Welche Fachbereiche in der Konzernzentrale und welche operativen Einheiten verantworten in Ihrem Unternehmen die strategische Früherkennung (verschiedene Konzernabteilungen und operative Einheiten)?
   - Auf Group Level: Group Strategy; Group Risk Management; Group Treasury (Investment, Insurance); Group Controlling
   - Group Treasury behandelt den Enterprise-Risk-Management-Prozess und inkludiert die Bereich Investment und Insurance
   - Group Strategy ist verantwortlich für Reporting und die Verfolgung von strategischen Chancen und Risiken.
   - Business Development teams in den operative Einheiten sind verantwortlich für strategische Frühwarnsignale (strategic early warning signals).
   - Zusätzlich haben die Divisionen und Business Units eine eigene Früherkennung
5. Welche Bedeutung kommt der IT-Unterstützung zu? Existiert ein standardisierter Prozess der Früherkennung oder wird diese eher „ad hoc“ und informell je Eintrittswahrscheinlichkeit, Schadenspotential ausgeführt?
   - Es existiert keine IT-Unterstützung im Sinne eines durchgängigen Früherkennungssystems.
   - Es werden nur Intranet-Technologien (SharePoint) eingesetzt und Dokumente und Berichte zu verteilen (MS Excel, PowerPoint, PDF). Der Berichtsprozess ist stark standardisiert.
   - Allerdings ist er Prozess auch sehr flexibel und kann deshalb auf externe Einflüsse schnell reagieren bzw. angepasst werden.

2 Evaluation (45 Min)

Zur Beurteilung Ihres Früherkennungssystems legen wir eine fünfstufige Likertskala zugrunde; das sowohl für Ihre IST- als auch Ihre SOLL-Beurteilung. Bitte beurteilen Sie wie folgt: „1“: sehr gering, „2“: gering, „3“: neutral, „4“: hoch, „5“: sehr hoch

2.1 Informationssammlung

1. In welchem Maße ist Ihr Früherkennungssystem auf *strategische Risiken* ausgerichtet? Wie werden diese erfasst? Berücksichtigen Sie auch schwache Signale wie Tendenzen, Stimmungen, etc?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
4	**5**	• Hauptzweck ist die Erfassung strategischer Risiken (dies ist auch gut abgedeckt, allerdings sind weitere Verbesserungen möglich) • Schwache Signale wie Stimmungen werden durch PMI (Purchase manager index) oder Confidence Index erfasst. Die Aufnahme in den Bericht ist meist Bauchgefühl.

2. In welchem Maße ist Ihr Früherkennungssystem auf *operationale Risiken* ausgerichtet? Wie werden diese erfasst? Berücksichtigen Sie auch schwache Signale?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
4	**5**	• Der Fokus auf Group level ist auf strategischen Fragestellungen, da vor allem Executive Committee Board und Senior Management die Adressaten bilden(daher auf group level Ist:2 Soll:2) • Operative Risiken fließen nur minimal und wenn dann in strategisch relevanter Form in das RM auf Group Level ein, sind aber grundlegen auf dem Level der Operationalen Einheiten abgedeckt.

3. Deckt ihr System maßgebliche *regulatorische Anforderungen* wie Gesetz zur Kontrolle und Transparenz im Unternehmensbereich (KonTraG), IFRS 1 „foreseeable future of at least one year“ oder SOX Section 404 „documentation of internal controls“ ab?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
4	**5**	• Regulatorische Anforderungen werden in einem gesonderten Kontext betrachtet (nicht auf Group Level, sondern in den dezentralen Einheiten) (daher auf group level Ist/Soll:NA)

4. Werden neben Risiken auch *Chancen* gleichberechtigt berücksichtigt?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
2	**5**	• Enterprise Risk Management konzentriert sich auf Risiken. Die Konzernstrategie berücksichtigt aber auch Chancen (jedoch wesentlich geringeres Ausmaß). • Allerdings besteht hier eine klare Schwäche des aktuellen Ansatzes. Aktuell ist der Fokus auf Risiken zu stark ausgeprägt. In Zukunft soll das durch chancenorientierte Business Development Teams verbessert werden.

5. Existiert eine *IS-Unterstützung* (z. B. Data Mining, semantische Suche, neuronale Netze/ künstliche Intelligenz), um die Intensität und die Geschwindigkeit Ihrer Informationssammlung zu steigern?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
2	**2**	• No system, other than Excel/Powerpoint. Currently feel that it is adequate and no new system is needed.

2.2 Informationsinterpretation

6. Die Interpretation von Informationen ist ein subjektiver Prozess. Persönliche Unzulänglichkeiten und Vorurteile können die Deutung der Indikatoren beeinflussen. Wird dieser Aspekt in Ihrem System durch *definierte Vorgehensweisen* vermieden?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
3	**4**	• Ein standardisierter Risiko Katalog wird für den Enterprise-Risk-Management-Prozess genutzt. • Es existieren ausführliche Anweisungen und Prozesse zum erfassen der risikorelevanten Dokumente und zum Erstellen der Berichte. Allerdings ist es explizit gewünscht das Bauchgefühl und die subjektive Note der Erfasser und Auswerter aufzunehmen. • Ergebnisse und Analysen durchlaufen eine 4-Augenkontrolle bevor sie an das Management weitergeleitet werden

7. Die Interpretation der Indikatoren ist oft schwierig und zeitaufwendig. Dieser Prozess sollte daher Erfahrungen im Sinne von *Wirkungsketten* oder das Wissen aus vergangenen Entscheidungen berücksichtigen. Inwieweit wird dieser Prozess von Ihrem Systems abgedeckt?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
2	**2**	• Standardisierte Vorlagen und Prozesse werden genutzt, um die Ergebnisse regelmäßig zu berichten (wöchentlich, monatlich, quartalsweise) • Wirkungsketten werden nicht oder nur sehr schwach abgedeckt.

8. Durch welche Methoden wird die *Analyse der Indikatoren* unterstützt? Sind z. B. Data Mining, semantische Suche, neuronale Netze/ künstliche Intelligenz oder andere Algorithmen vorhanden, um Zusammenhänge zwischen Indikatoren und finanziellen Kennzahlen herauszuarbeiten? Wie gehen Sie dabei mit historischen Informationen um?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
3	**4**	• Statistische Standardmodelle in Kombination mit Management Insights werden genutzt um das Geschäftswachstum mit den externen Opex- und Capex-Indizes zu korrelieren. • Zusätzlich existiert ein selbst entwickeltes, komplexes Vorhersagemodell zur Prognose von zukünftigen capital expenses und operative expenses sowie der GDPs jedes Landes. Hierzu werden die GDPs der letzten 5 Jahre analysiert und auf die kommenden 5 Jahre fortgeschrieben. Dieses Modell ist ziemlich genau und ist seit 2008 erfolgreich im Einsatz

2.3 Informationsnutzung

9. Wie würden Sie die *Informationsdarstellung* Ihres Systems bewerten? Wie ist das Feedback der Führungskräfte und der Fachabteilung?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
4	**4**	• Informationen werden mittels Intranet(„Sharepoint") verfügbar gemacht. Abhängig von den Berichten kommen PDF, Powerpoint und einfache Emails zum Einsatz. • Die Anwender wollen PowerPoint- und PDF-Dateien. Es ist explizit kein Web-basiertes System für das Risikomanagement gewünscht.

10. Wie würden Sie die *Navigationsfreundlichkeit* innerhalb Ihres Systems bewerten? Wie ist das Feedback der Führungskräfte und der Fachabteilung?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
3	**4**	• SharePoint Funktionalitäten sind bei der Informationsverteilung vorhanden. Weitere Verbesserungen wären wünschenswert. • SharePoint wird nur zur Informationsverteilung herangezogen. Die Navigation erfolgt im Dokument (MS Word oder PowerPoint) bzw. auf Papier (innerhalb des gedruckten Berichts)

11. Gibt es innerhalb Ihres Systems *Kommunikationsfunktionalitäten*? Ist es Ihnen beispielsweise möglich aus dem System heraus eine Anfrage an eine betreffende Person per Email, Kurznachricht oder persönlichem Gespräch zu stellen?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
2	**3**	• Die direkte Kontaktaufnahme mit den Ansprechpartnern der Berichte ist über SharePoint möglich.

12. Über die genannten Punkte 9 bis 11 hinaus, wie schätzen sie die *nutzerfreundliche* Verwendung der gesammelten und interpretierten Informationen mit Hilfe der IT-Unterstützung ein?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
3	**4**	• SharePoint Funktionalitäten sind bei der Informationsverteilung vorhanden. Weitere Verbesserungen wären wünschenswert. • Die Risikomanagement-Dokumente sind im Intranet zentral verfügbar und schnell auffindbar.

2.4 Prozessübergreifende Aspekte

13. Wie zeitnah erfasst, verarbeitet und stellt Ihr System mögliche Chancen und Risiken Ihnen zur Verfügung? Ist dies für alle Beobachtungsbereiche gleich oder gibt es dort Unterschiede?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
4	**4**	• Über Email und Sharepoint werden Berichte wöchentlich, monatlich, quartalsweise und jährlich zur Verfügung gestellt. • Zusätzlich zu den jeweiligen standardisierten Berichten (wöchentl., monatl., quartalsweise, jährlich) gibt es auch ad-hoc Aufbereitungen und Erhebung der Daten (z.b. neue Events und Risiken). Gleiches gilt für spezielle Events. Berichte dazu werden ad-hoc erstellt und zur Verfügung gestellt.

14. Wie *flexibel* kann Ihr System auf Veränderungen in Ihrer Aufgabenstellung wie z. B. neue Beobachtungsbereiche oder Frühindikatoren reagieren?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
5	**5**	• Das System kann schnell an neue Anforderungen und Situationen angepasst werden. Es ist sehr flexibel.

15. Wie *genau* (Vorlaufzeit, Eintrittswahrscheinlichkeit, Schadenspotential, sowie Indikatordaten insgesamt) sind die Informationen, die Ihnen bereitgestellt werden? Legen Sie mehr Wert auf den Gesamtzusammenhang oder steht die Genauigkeit einzelner Angaben im Vordergrund?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
3	**4**	• Gesamtzusammenhang ist wichtiger als einzelne Datenpunkte. • Nur der Gesamtzusammenhang ist wichtig. Es geht nicht um die Ermittlung von Einzelwerten. Eine Trendidentifikation ist das Ziel, deshalb werden zur Bewertung Harvey-Balls verwendet. (http://www.tushar-mehta.com/publish_train/xl_vba_cases/0302_Harvey_Balls.htm)

16. Wie schätzen Sie die *Zuverlässigkeit* ihres Systems im Sinne einer Vermeidung von Manipulationen, Störungen und technischer Fehler? Wie ist die Abstimmung mit Wirtschaftsprüfern, gar eine Zertifizierung?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
4	**4**	• System ist einfach und unkompliziert (Excel/Powerpoint/Sharepoint) • Es wird keine systematische Prüfung durchgeführt. • Einsatz des 4-Augenprinzips bei der Datenerfassung und Interpretation. • Manipulationen der Daten sind aufgrund der der organisatorischen Eingliederung nicht sehr wahrscheinlich. • Absicherung der Ergebnisse erfolgt durch gegenläufigen Top-Down/Bottom-Up Prozess zur Verifikation der Ergebnisse. Die Schätzungen werden von oben und von unten gleichzeitig gemacht und nachfolgend verglichen.

17. Inwieweit werden unternehmensübergreifend Partner wie Lieferanten, Kunden, aber auch Forschungspartner, kreditgebende Banken und Ratingagenturen etc. in Ihrem System integriert? Gibt es Kooperationen zur Sammlung, Interpretation und oder Nutzung von Informationen?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
2	**4**	• Externe Partner sind nicht aktiv beteiligt. Allerdings basiert das System auf externen Datenlieferanten (Global Insight, Bloomberg) und einigen Pressclippings-Dienstleistern. • Die Einbindung von Kunden und Lieferanten wäre jedoch für das Unternehmen wünschenswert (z.B. Cashflow-Information, Bestellungseingang).

18. Inwieweit sind IT-gestützte Validierungsprüfungen innerhalb ihres Systems vorhanden? Gibt es darüber hinaus Maßnahmen, die die Transparenz des Systems steigern sollen? (Prozessdarstellungen etc.)

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
2	**4**	• Es existiert kein IT-System zur Unterstützung. Es wird jedoch mit der internen Revision zusammengearbeitet, um beispielsweise die Umsetzung von Mitigationsplänen sicherzustellen (alleine IT Fokus, Ist: 1, Soll: 1)

2.5 Aufwand

19. Welche *Kosten* sind bei der Entwicklung des Früherkennungssystems entstanden und was sind in etwa die Kosten des laufenden Betriebs (Anzahl Mitarbeiter, Software, Hardware)?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
2	**2**	• 1 Jahr für Konzeption (3 Mitarbeiter) und 3 Monate für Einführung des SharePoint, 0.1 FTE (FTE=full time equivalent) für ständigen Support • Enterprise-Risk-Management-Prozess: 9 Monate Entwicklung, 0.3 FTE ongoing support • Kosten: Einführung, 3 Personenjahre 3 x 200 000 CHF = 600 000 CHF Betrieb des Systems 80 000 CHF pro Jahr + Kosten des Enterprise Risk Management Prozesses

20. Wie hoch war die Zeit, die zur Konzeption und Implementierung des IS aufgewendet wurde und wie ist der laufende Zeitbedarf der Pflege (Verhältnis zwischen Zeitaufwand und Nutzen)?

Bewertung IST (1-5)	Bewertung SOLL (1-5)	Kommentar
3	**3**	• Sharepoint - Konzept: 1 Jahr • Sharepoint - Entwicklung: 3 Monate • Enterprise Risk Management Prozess: 9 Monate für die Entwicklung und das Konzept