Scenarios and Early Warnings as Dynamic Capabilities to Frame Managerial Attention

Abstract

This paper proposes that relating scenario planning with early warning scanning provides firms with synergic capabilities that help frame top management attention on possible future contexts and how they might unfold. The research is based on two case studies and makes two scholarly contributions: it discusses cognitive aspects in sensing by analyzing scenario planning and early warning scanning as dynamic capabilities; and it provides an exploration of the synergies between both. The paper may also help reflective scenario planners and competitive intelligence professionals to better connect their work.

1   Introduction and purpose of this paper

In today's business environment, more and more companies are concerned with how to adapt to turbulent environments and to identify opportunities such environments can offer. The dynamic capabilities (DCs)[i] view has emerged as a seminal framework to explain how companies act to achieve this [1,2]. Eisenhardt and Martin defined DCs as "*the organisational and strategic routines by which firms achieve new resource configurations… to match or even create market change"* [3 p.1107]. Sensing the environment and opportunities is one of three dynamic capabilities, along with seizing these opportunities and reconfiguring resources [1]. Our research studies how scenario planning (SP) [4-8] and early warning [9,10,10-12] scanning (EWS) work as both distinct DCs and together as a co-specialization dynamic capability (CDC). This paper arose from a real-world concern: how to enhance the usability and life-in-use of SP in organizations, by examining how competitive intelligence and EWS use SP and can contribute to making SP investments worthwhile.

Our research is grounded in two case studies and spans the period from 1994 to 2008. We studied Nokia and Statoil, two companies with a history of combining SP with EWS. We were able to capture a multi-year history of episodes of SP practices that gradually evolved into stable

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[i] List of abbreviations used in this paper:

CDC   Co-specialization dynamic capability
DC   Dynamic Capabilities
EWS   Early Warning Scanning
SP   Scenario Planning

DCs. During the same period both companies also linked SP DCs with EWS DCs in their competitive intelligence practices. We compare how Nokia and Statoil interlinked SP and EWS as 'blended' [13] CDCs, similar to previous analyses of Rolls-Royce [14] and Daimler-Benz Aerospace [15].

This paper is organized as follows: We overview six cognitive aspects of sensing DCs and describe how they are embodied in SP and EWS. We then analyse each case from this perspective, and illustrate how each of the six characteristics work in both firms. We then compare the cases and present our conclusions for research and practice.

While the literature on DCs is extensive, we have focused on Teece's approach as we agree with Hodgkinson and Healey [16] (who reviewed DCs in a helpful and critical way) that this approach is the most influential.

2   Cognitive aspects of sensing

Teece [1] suggested that sensing and shaping new opportunities as a DC is very much a scanning, creation, learning, and interpretive activity. For Weick [17], scanning and interpretation are about 'enacting environments' in one's mind, that is, converting the activities and processes of imaginative and perceptual mindfulness into 'issues' [18]. Issues can be, and often are, further classified as opportunities and threats, and readied for actionable seizing [19]. In this paper, we argue that it is the production and transformation of issues that enables the seizing and reconfiguration of DCs.

As we compared our cases with the existing literature on managerial cognition, six cognitive aspects emerged, illustrating how sensing proceeds to seizable issues. These are detailed in Table 1.

Insert Table 1 about here

2.1   *Aspects 1 and 2 – Imagining and experiencing.*

Sensing can be based on what is imagined as possibly existing in the future, manifested as explicit expectations, or on actual experience. Damasio [20] has shown that feeling precedes conceptualization and Schlag [21], in studying US judges, suggested that the articulation and form of this first feeling decisively shapes subsequent concepts. Both Damasio and Schlag echo the views first expressed by philosophers Cassirer [22] and Langer [23] where form is first felt, and then articulated or 'packaged' for sharing by symbol systems. Langer and some of her students (c.f. Ramírez and Dean [24]) proposed that it is the aesthetic branch of philosophy that best describes how these initial forms are first apprehended, experienced and shared by the mind, launching a subfield of organizational research known as organizational aesthetics (for a good overview, see Strati [25]).

Whether the aesthetically apprehended initial form is imagined or experienced, mind shapes a form: Consider how your mind forms an image of your next meeting and an expectation of how well it might go. The form distinguishes what is included from what is excluded. The form is the basis for in-form-ation: As Gregory Bateson [26] famously put it, *information is the difference that makes a difference*. In experiencing or imagining, this difference distinguishes which stimuli are noticed from those that will remain unnoticed [27]. With the forming of form, the sensing and/or imagining inform the mind. Cassirer and Langer proposed that if the symbol system the mind uses is discursive, it will label the form; otherwise, it may share the symbol with another mind via painting, sculpture, dance, or music.

Within companies, SP teams are more concerned with imagining possible forms that may arise for future experience, while EWS teams are tasked with quickly forming, packaging, and sharing newly experienced forms that either had, or had not, been imagined before.

2.2   Aspect 3 – Patterning.

Pattern is perceived coherence in information [28]. "Patterning" refers to how patterns are conceived in an organization's storytelling [29] and is at the heart of how forms evolve into frames. Frames are forms that are rendered communicable: This rendering is produced through patterning, and symbolic devices such as language or graphs are employed to connect the new forms as frames from one mind to another [30].

The impetus for patterning arises from the need to make sense or from the need to influence the sensemaking of others. In enacting the environment(s) in the mind, one chooses to focus on the forms that make more sense than others. The forms that are used in the individual's sensegiving efforts [31] become new frames (or new parts of more comprehensive frames) through patterning, and they bring forth new interpretations to members of an organization [17],which, in turn, helps them make sense anew.

SP is a powerful practice for imagining new forms and for patterning those forms into new frames of plausible future environments. A scenario can become an active organizational frame when the insights it offers are taken up in sense-making activities by members of the organization. It is, however, in comparing more than one frame and in comparing the distinct senses these (at least two) scenarios offer that scenario sets offer unique value. Open-minded individuals in organizations may imagine, pattern, and thus produce and even adopt new frames fairly quickly when working alone, but as Hodgkinson and Healey [16] point out, this is easier done in small groups. This collective reframing offers one explanation as to why van der Heijden proposed that scenarios enable higher quality strategic conversations [5].

As with SP, EWS also engages in patterning. EWS professionals sense, identify, scan, uncover, label and categorize actual and potential issues. Often, existing frames are employed, but occasionally new frames are patterned to determine the saliency of both newly identified and existing events and signals. In this paper we suggest that when SP frames re-prioritize saliency criteria, EWS works especially well in helping senior managers attend to what was peripheral in prior frames, and to identify and follow newly identified issues (threats or opportunities) emerging in the environment. We found that EWS can also sustain the unfolding patterning in SP-produced frames, making them more sensible by continuously experiencing, appreciating, and even patterning the environment in one's mind and those of fellow managers. As new forms or categories are identified, EWS can also pattern these to make scenario frames evolve or change.

2.3   *Aspect 4 – Framing.*

Further to what was stated above, managerial cognition research suggests that frames help to resolve uncertainty and ambiguity for organizational action (compare with Walsh [32]), and are the key to gaining insight [1]. As frames are used in organizational communication, some

meanings are accepted over others [33] by driving certain interpretations and not others [34]. Framing is about creating meaning with frames. An act of framing can be simultaneously an act of patterning if new frames emerge from it. The notion of a 'frame' is also helpful in that it brings 'into the frame' that which would have otherwise remained peripheral [35]. However, one must consider the manipulation that this can entail, such as 'framing' people in crime.

Frames focus and shape management attention. As managerial attention is limited, managers attend only to the most salient of all possible environmental stimuli [36]. Frames act as interpretation schemes [34,37] and in so doing, determine which events and signals attention will consider as most salient. Frames direct sense-making efforts [17], affecting the interpretation and meaning given to an issue, and thus the available courses of action to address the issue [38,39].

An organization often has a set of dominant, sometimes inertial frames, which direct and constrain its interpretation processes [34,38]. Teece proposed that *"overcoming a narrow search horizon is extremely difficult and costly for management teams tied to established problem-solving competences"* [1 p.1322]. He cited Henderson [40] who found that GM, IBM, and DEC became prisoners of the deeply ingrained assumptions, information filters, and problem-solving strategies that framed their worldviews. The unquestioned framing converted what had once helped to make them great firms into strategic straitjackets.

Yet dominant frames can change—sometimes because of environmental jolts [41], as a result of conscious strategic change, or perhaps driven by the arrival of a new CEO (see for example, Gioia & Chittipeddi [31]). By timely surfacing and questioning of existing frames, and by producing new frames, which are central to sensing DCs, managers using SP can avoid an unwitting lock-in to inertial strategies and their legacy frames [42]. In this way, scenarios can act as a wind-tunnel, forming a framing device to surface and test strategic assumptions [43,44].

2.4   *Aspect 5 - Reframing.*
Each individual organization member has his or her own individual psychology, unique life experiences and education and therefore frames issues differently [45]. Also, individuals often frame something differently depending on which audience they interact with [29,46]. While reframing an issue in multiple ways is natural and common among members of an organization

[33], dominant frames do emerge and become sustained, and impose a more-or-less "official" interpretation to a given issue. SP helps to reframe issues by offering multiple legitimate frames to highlight the limits of the existing dominant frame [43,47]: Considering more than one frame as plausible renders dominance by any one frame harder. Often the purpose of the scenario framework, the frame-of-frames, is to impose stark differences among the variety of scenarios. Minor differences between scenarios would not meet the SP requirements of countering psychological biases and of framing major uncertainties in instead of out [48].

2.5   Aspect 6 - Highlighting.

Highlighting is an act of conceiving and promoting issues, thereby directing attention to certain issues ahead of others [39]. Conception of an issue takes place when stimuli and framing of them are perceived as significant [49]. Issues are conceived in minds of individuals or small groups. They can become organizational when issue promoters engage in sensegiving focused on legitimating the issue [30,46] and possibly categorizing the issue as an opportunity or threat [19]. Successfully legitimated issues are deemed worthy of further attention investments [36,49]. All acts of highlighting are also acts of framing, but not all acts of framing are acts of highlighting. An act of highlighting is also occasionally an act of patterning in those cases where new frames emerge.

Highlighting occurs at several stages of SP and EWS exercises. Initially some issues may be set as scenario questions [50] and thus are highlighted as focal issues for further patterning, framing and reframing. SP directs attention when new issues are highlighted and thereby determines the agenda for further conversations [43]. Highlighted issues are typical outcomes of EWS exercises. As the multiple frame set offered by SP can also relate a given issue in more than one way, the variety that SP offers supports multiple interpretations of an issue, and enables disagreement to become a productive asset. This is why van der Heijden thinks of scenarios as supporting 'strategic conversation quality' in artful ways [5].

3   Research method

The research design is multiple-case, using the constant comparative method [54], in which each case helps to confirm or reject emerging insights from the other case [51]. We had research access to two of the largest Nordic companies by revenues, Statoil and Nokia, (as

reported by www.largestcompanies.com). The companies are from different industries hence their different dynamics provided additional variation. Yet both companies had a several-year history of deploying SP episodically, and both gradually integrated EWS to support their SP exercises. This similarity led us to investigate aspects that might explain the converging patterns linking SP and EWS.

As both SP and EWS deal with dynamic aspects of the environment, and both practices grew into stable and replicable processes, we chose to study these practices as sensing DCs. We captured longitudinal data over several years, helping to identify how interactions between SP and EWS practices were formed and to establish when and how they could be considered (semi-)stable dynamic capabilities instead of ad hoc temporary activities [52]. Using the coding techniques of grounded theory [53], we took note of participation, dynamics between participants, and salient cognitive processes underlying the creation of the scenario deliverables. Our view of cognitive processes was guided by our preconception of scenarios as framing vehicles [43]. In the spirit of constant comparative method [54], we produced several comparison tables using categories we found in both cases in order to study commonalities and variation between the cases.

The origin of our research was a meeting amongst the authors in the 2006 European meeting of the 'Strategic and Competitive Intelligence Professionals' (SCIP) in London. We discovered that professionals in the competitive intelligence EWS, SP, and strategic planning professional communities of both Nokia and Statoil were experimenting with how to better link SP and competitive intelligence EWS. We obtained permission to compare these efforts from executives in each company and we made the first joint presentation of our findings in the October 2007 Strategic Management Society (SMS) International Conference in San Diego. After our original meeting in 2006, we systematized the two situations by making a comparative table. We reconstructed the 15-year trajectories of both case studies, using available documentation and by interviewing key individuals. Between October 2007 and July 2011 we revisited the data, presented findings in several executive education programs, and conducted further interviews to analyze both cases.

The data gathering was done as follows. At Statoil, the third and first authors acted as SP and EWS consultants for more than three years. They worked closely with the Head of Corporate

Strategy (who was in that position for two years and also became head of SP in 2007), the former Head of Corporate Planning, and the former Head of the SP Team, who had been in the company for four years. The third author participated in discussions with these individuals and their team members every month for the three years in question. These half- and full-day meetings were documented in analysis reports that were shared in a team workspace allowing subsequent retrieval and analysis. In all, more than 20 reports were analyzed. The third author also held dedicated sessions and interviewed seven managers to progressively uncover the flow of events; consulting relevant and available documentation from current and former SP development and use as necessary. The managers held positions as head of strategy, head of SP, head of analysis and head of finance. The interviews, of 1-1,5 hours length, were conducted in November 2006, January 2007 and June 2008 and were structured as follows:

- When were scenarios developed?
- Why were they developed? For what purpose(s)?
- Who took the initiative?
- What triggered the event?
- How were they used?
- How was the scenario team composed?
- What was top management's participation?
- What scenario development and engagement processes were used?
- What was the main value obtained from the scenarios and the engagement process, and how was the value assessed?

The interviews were documented in text form, and in July 2008, in order to mitigate biases and incompleteness, the third author sent the interview transcripts to the interviewees for comments, triangulated data among interviews, and compared their statements with internal and public documentation to obtain consistency. Where necessary, further clarifications were sought with the interviewees.

At Nokia, the second author held the position of Head of Competitive Intelligence until mid-2008, and worked in the closely related role of Head of Services Intelligence until late 2010. He participated in 2006-2007 scenario process as one of the facilitators. In that role he participated in the conducting of the workshops, EWS process management, the scenario book writing, and preparing the process proposals of both EWS design and the updating of the scenarios and how to design the updating of management. During the preparation and after management decisions he kept a journal of the discussions held among process facilitators and with management,

capturing process experience of events and views on future process requirements. He also further interacted for the purposes of this paper with Nokia's Director of Strategic Planning and with the Director of Strategic Projects (both of whom had been in their respective functions for over 11 years and key SP facilitators since 1996) and with the Market News Manager who had been 11 years in the company and two years in this position, conducting altogether five semi-structured one hour interviews in order to learn more about previous scenario processes with issues that included::

- What happens / happened in each process and how were these processes related?
- Who are / were involved?
- What were the methods applied?
- What was the purpose of each process design?

To verify for incompleteness and biases, he sent the case description to his informants for comments and made subsequent adjustments in several iterations in March 2007, October 2007 and September 2008. To test the relevance of our findings for the communities involved, we held internal meetings at both organizations and asked the researcher(s) in the Nokia team, whom we considered knew each case the least, to query the validity of each account.

4   Case Studies

4.1   Scenarios at Statoil
In the early days of scenario development and use at Statoil (in the 1980's), top management participated intensively in creating the scenarios, and was closely informed by them.

The initiative to conduct scenarios was inspired by Shell and came jointly from the Head of Corporate Planning and the Executive Vice President. The issue of rising oil prices was highlighted, triggering the scenario work, and interest in SP was later reinforced due to emerging climate concerns. As traditional forecasting appeared limited in dealing with the complexity and uncertainty involved in both issues, Statoil went from traditional forecasting through "qualitative sensitivity analysis" into industry scenarios, introducing and highlighting new aspects such as climate and regional policy issues.

The SP team consisted mainly of internal people from corporate planning and the Oil Trade Business Unit. At later stages, the climate issue was further highlighted in the frame, at which point external collaboration on technology and politics was introduced through a link with the University of Stavanger, and consultants were used for SP process facilitation. The scenarios from the first SP round served as a one-off strategy with information input helping top management to frame its context. The scenarios were also presented on a business unit road show around the country, but otherwise appear to have been underutilized.

The main perceived value was the deeper and broader understanding of complex issues, such as climate change and regional politics, by the members of the SP core team—issues that had been brought forth by the SP framing and reframing. A key learning outcome was an understanding of how demanding it is to develop good scenarios and how it helps to have the users invent the scenarios, that is, pattern their ideas into communicable stories. Top management, which was involved in developing the scenarios, used them more than business unit managers who were not involved. The scenario patterning thus renewed top management frames more than middle management frames.

The second time that scenarios were produced (in 1995 with an update in 1998), they were more qualitative and seen by management as more of a 'fun' thing to do. The link between SP and top management was weakened and instead the scenarios framed internal communication leaflets. These were used to educate staff, helping them imagine different future contexts, and for positioning of the company as forward thinking in a one-off engagement with the World Energy Council.

The initiator and the main driving force for the second round was corporate strategy, and top management was not involved in producing this set of scenarios. Instead, external researchers were invited to conduct internships on SP activities. To succeed with the internal and external communication aspects, an external public relations consultant was engaged as a participant throughout the whole SP process. This second round also included both supply and demand aspects and highlighted transportation issues.

In 2004, a new CEO came into office and a third round of SP was undertaken. The new CEO gave more value to future thinking and requested further scenario work to increase top

management's understanding of the business context, and to highlight new strategic options. The highlighted issue shaping this round of SP was the rapid changes in the world, which induced a deeper understanding of the unreliable nature of long term 'forecasting' in such contexts, and how the complexity of the business required a richer and more robust framing of the issues. This third set of scenarios was linked not only to top corporate management again, but also to senior managers in the business units. A difference from earlier SP rounds was that it was an explicit ambition to use the scenario process to build a new, widely shared framing of the issues, and to extend the planning horizons of the new group management by reframing the time-horizons and breadth of what mindfulness needed to attend to. In addition, the scenarios were used to contest the dominant frames and the strategic beliefs of the company, to create strategies, and also to ensure that the business units used them.

The Corporate Strategy Team had an organizational scenario unit and more than half of the group management participated in the SP process. An external consultant was used early on to provide content and also for facilitation.

This SP process helped the business to structure strategy work and to create a platform where concerns could be discussed on safe and common ground, thereby disclosing differences in assumptions and beliefs, that is, individual frames—for example, frames regarding the public acceptance of exploration of unconventional hydro-carbons or the possibility of commencing oil and gas exploration in the High North. It also helped build the group management team and extend its planning horizon by using the scenarios as a (re)framing device for its attention, both individually and in its strategic conversations, in order to highlight issues outside the hitherto expected frames and help to resolve uncertainty and ambiguity for organizational action.

At approximately the same time as the creation of the third round of scenarios, and on the initiative of the Head of Strategy at the time, an EWS process was introduced through Corporate Strategy Newsletters. The newsletters were on the competitive environment with no links to scenarios, other than through top management itself. However, each scenario had "Pockets of the future in the present" defined from the newsletters—a pre-stage to the EWS use.

It was decided to simplify the third set of scenarios to make them clearer and easier to communicate by reducing the number of scenarios from four to three. As top management had

declared that the scenarios were to be used to test decisions, multiple sets of focused scenarios, derived from the streamlined corporate set, were developed for countries, market segments and business areas. The focused scenarios were used variously for strategy testing, strategy development, option generation and option testing by a) highlighting market and business specific issues in the analysis frames, for example, country specific conditions in the Middle East and Russia, or demand for Gas and Renewable Energy in Europe; and b) by challenging and reframing existing dominant frames, such as the (non-)importance of domestic public opinion of Norwegian Continental Shelf production.

Corporate Strategy also planned, sourced and developed an EWS. This was deployed by the scenarios team within Corporate Strategy and informed a network of competitive intelligence editors and experts throughout the organization, including those of the newsletter.

At this stage the EWS had no links to the existing competitive intelligence monitoring processes in the business units. However, the issues monitored in the EWS were derived from the scenarios, challenging the limits of the existing dominant frames in the scope of the competitive intelligence monitoring. An important aim of the Corporate Strategy Team was to build a competitive intelligence EWS network, to develop relevant skills and set up processes to systematically monitor key indicators for the industry, which both used and also further developed the scenarios by explicitly experiencing gradual change, patterning the unfolding issues and thereby highlighting novel aspects to the analysis frames.

Starting in 2007, key uncertainty areas and indicators derived from the scenarios were defined. These established a "signals architecture" frame for tracking scenario unfolding. A web-based EWS was established where external sources and internal editors provided input to the early warning process. The development of the EWS followed requests from top management, and led to the understanding by Corporate Strategy that the business context changes so rapidly that the existing five- to ten-year scenario development frequency simply would not be high enough. The rate of change in the contextual environment exceeded the scenario production cycles in place at Statoil, and so a process for more continuous and constant patterning, framing and highlighting was called for. The scenarios have since been used qualitatively [55,56] to identify possible "weak signals" or "early warnings" [35,57,58], for example by picking up climate policy

conversations in the European Commission, or detecting demand shifts in the energy mix in certain European countries, or spotting energy technology progress within renewable energy.

In the second half of 2007, a complementary analysis process was initiated where editors, appointed to each scenario, used the EWS to experience the unfolding of "their" scenarios. The evidence was presented at quarterly analysis meetings where a facilitated strategic conversation of patterning the scenario unfolding and framing the implications took place. Analysis reports were created and made available in the EWS, highlighting the findings to the strategy network and top management. The analysis process helped editors and analysts to dynamically reframe the signals categories and sources, in order to monitor and enable the continuous re-assessment and adjustment of the scenarios.

There were several situations in the 2007-2009 period where Statoil's top management team attended to highlighted issues by framing and reframing them in their strategic conversations—informed by SP and the EWS and informing their strategic decision making. For example, the scenarios were used when composing the project portfolio collection by changing its geographic spread, energy types, and investment time horizons. A specific area that was highlighted by the SP-EWS work is climate change. Here the firm's monitoring and analyses of climate change and climate policy-making emerging trends led to the 2007 decision to develop the Statoil climate strategy, focusing on major greenhouse gas sources and attacking those point emissions sources that caused the greatest impacts [59].

Statoil's top management team evaluation of options and suggestions is a continuous process and it is difficult to say if seizing an opportunity was solely due to the SP-EWS CDC combinations. However, the top management team was highly influenced by their scenarios set when they planned and worked on the merger with Norsk Hydro, which by 2009 had produced annual cost improvements of approximately NOK 5.5 billion. This was also the case when they analyzed prospects in the gas value chain [60], including LNG and unconventional hydrocarbons such as US shale gas [61].

During the research period, SP and EWS became a mindset and a practice for the Statoil top management, which allows us to propose that each mindset became a DC, and jointly, a CDC.

Bingham et al. [3] showed that this type of stabilized heuristic enhances learning more effectively than even long-term experience. The priorities (that is, the highlighted issues-as-outcomes) arising from the scenarios that Statoil's SP manufactured set the newly framed focus for the EWS. Their EWS DC helped strategists and managers keep this attention alive. A good example is Statoil's Canadian Oil Sands Initiative, where early signals included warnings on how expected oil prices and public awareness might determine acceptability of producing oil there. Oil Sands investments failed in one scenario and were acceptable in another, and the contrast framed how Statoil monitored the continuously unfolding situation and helped the scenarios to directly contribute to determining project strategy.

Similarly, one scenario regarding the development of unconventional gas was seen as acceptable when the possibility of a gas 'bridge' between oil and post-oil energy worlds had been considered. EWS focused on signs of this future unfolding and this conceptual framing helped Statoil determine where to focus its new technology investments.

4.2   Case two: Nokia

Although Nokia had earlier experiences of SP (anecdotal data indicates an exercise timed somewhere between 1989 and 1991), our case data begins in 1994, when Nokia drafted scenarios in a workshop. The purpose was to engage top management to make sense of the future of the industry. It was an explorative one-off exercise. The scenarios were used as an input to strategic thinking, but weren't directly used in making the company's strategy.

The SP process was initiated by a member of top management, and external consultants were hired to facilitate it. These consultants conducted interviews to identify key concerns and aspirations, opportunities and threats, and develop key scenario questions, thus capturing the results of managerial experiencing, framing and highlighting. A workshop used the interview results, formulated the scenario drivers, and developed the scenario set framework. Scenario teams then developed the scenario content, thereby also engaging in imagining, patterning and reframing. These scenarios were not published, and were used exclusively to frame top management team's understanding. We did not find links to changes in wider organizational cognitive processes.

Two years later, the same method and facilitators were used for a similar scenario workshop, again as a one-off exploration. The key uncertainties were purposefully different thus producing a new set of scenarios, rather than refreshing the 1994 set, and thus re-framing understanding. The SP exercises of 1994 and 1996 represent all six cognitive aspects of sensing as one would expect from a versatile and engaging exercise. However, the exercises did not directly link to wider organizational sensing. The idea of linking a competitive intelligence EWS to scenarios did not occur on these iterations, nor were the scenarios used explicitly as inputs in the annual strategic planning of the following years.

In 1997, a big competitive intelligence EWS effort was launched. The Market Alert Newsletter was started by the Nokia Corporate Market Intelligence team to alert top management of new events and developments (that is, issues) in the market—an effort of experiencing (as scanning) and highlighting. The Market Alert Newsletter needed to attract readers so it was designed to be an 'easy read' by adopting some of the features of tabloid newspapers. The Newsletter's effectiveness thus depended upon a well-qualified, full-time editor and was distributed on an almost daily basis.

Initially the Newsletter was only distributed to the top 30 managers, but over time the audience grew to several thousands, making it a much more widely visible form of organizational sensing than the scenario exercises of 1994 and 1996 had been. The Newsletter started with a focus on timely coverage of hot news. Competitor actions have always been a major area of coverage. In particular, the editor often chose to present repeated coverage around a certain theme that he perceived to be a blind spot for the company and its dominant frame, thereby actively engaging in framing, rather than merely experiencing and highlighting.

By spending more time studying news sources and related discussion on the Internet, the editor had a unique feel for the themes that seemed to excite mobile phone enthusiasts—a unique frame of hot topics/issues for industry insiders. One such issue that our informants still recalled after several years was the "clamshell" form factor of the phone, a feature that started to gain popularity in late 90s and early 2000s.

The Newsletter, which over time influenced top management sense-making and attention, was distributed by e-mail as the primary distribution mechanism at the time of our research. In the late 90s, text messaging was occasionally used for the core audience in the case of hot signals. The CEO contacted the editor repeatedly to check on the facts of many stories. The newsletter was also successful in influencing organizational sense-making of a large number of people outside top management, but there were no mechanisms to manage the feedback loop, or the patterning or reframing that might have occurred in the feedback.

In 1999, SP was re-launched to address two highlighted issues. The goal was to frame the unfolding of two major trends in the telecom market: the emergence of data communications, and the evolving nature of mobility. Top management decided to be closely involved again. They engaged internal facilitators, who had gained their experience in the 1996 SP process, and who used a similar process with interviews, scenario workshops and scenario teams. Significant focus was placed on more than 40 interviews with top and middle managers lasting 45 – 60 minutes each. A two-by-two scenario framing of four purposefully different understandings was developed.

This time the scenarios were communicated to wider Nokia audiences as a part of the common Annual Strategy Sharing Process, taking the framing, reframing and highlighting activities beyond the SP participants. A light-weight scenario follow-up process was established whereby all the Market Alert news from one month were categorized to measure how each scenario unfolded, creating experiencing, framing and highlighting that was common to both SP and competitive intelligence EWS. This created the first SP – competitive intelligence EWS link, and the results were seen to validate the scenario framework. However, this was a one-off effort, as the engagement lasted less than a year. Again, management sensemaking took place, but according to our informants, the frames that were developed in the process were not subsequently deployed.

In 2005 the second editor took over the Market Alert Newsletter, further growing its readership. Text message distribution was discontinued as mobile e-mail emerged. In a new effort to bring a reframing element into the process, a Nokia internal Market Alert Blog was established to complement the email distribution, enabling more interaction with the audience. Very good

stories attracted numerous comments in the blog, some of which added significantly to the level of insight. The blog started a process where active feedback created a dialog with multiple and interactive steps of framing and reframing.

Also in 2005, after a six-year break, top management decided to launch a new round of SP. It was again facilitated internally, using the 1999 process design, although with no clear predefined themes. The top management team members worked even more strongly than previously and in four teams, each patterning one scenario as fully as possible. Storytelling-oriented narrative was chosen as the main format, complemented by a list of distinctive characteristics, analyses of winners and losers, and paths of events. Many distinctive characteristics, such as "operational mobile data offering decisions" emerged from several scenarios with interestingly diverse framings.

This time management wanted to sustain the sensing activities for a longer time period. An explicit link to EWS was forged and so a CDC was set up. Each scenario path framed the types of events and signals that EWS would subsequently note, monitor, and communicate. When the scenario documentation was completed, top management team members expressed their views on the categories of events, which became early warning signal areas, thus enriching the scenario frames with a new complementary process embracing both the continuous change of the environment and its uncertainty.

This clarified (that is, patterned) the top management ideas of how certain types of events might add momentum to the unfolding of a particular future or a set of futures. It also provided an opportunity to reconcile possibly competing theories or frames about the future, establishing a "neutral" arena where "objective observations" would determine which frames offer the better explanation. The EWS categorization was thus an open "composite" framing, focused on anticipated and imagined forms. They were patterned into a single over-arching frame-of-frames that called for subsequent experiencing in order to highlight some categories while discarding others.

An important result of the 2005 SP work was setting up a continuous EWS process to track the four scenarios. The EWS team experienced/scanned for signals determined by the 23 pre-set EWS categories that were established in the SP, such as "consumer willingness to pay for mobile and online services". Each category was analyzed based on collected signals that were compiled into a quarterly scenario follow-up report. In addition, each category was summarized and a synthesis was provided in order to outline which of the scenarios had become more likely as a result of the signals. These elements highlighted some categories more than others and also framed the perception of the industry evolution.

Both qualitative and quantitative signals were collected from a rich variety of sources. News sources, company reports, and consumer surveys were the most important. The news sources were reviewed several times with regional experts to avoid a Western-world bias in markets such as India, where Nokia enjoyed a commanding market share. EWS could thereby integrate a broader set of highlighting and framing acts to better make sense of the situation.

As the number of sources grew, so did the number of potentially relevant signals. The first screening step was assured by a member of the EWS team tasked with the ongoing monitoring who handpicked (that is, highlighted) the signals that were shared in an intranet blog. The practice of handpicking was the only way to measure saliency, as saliency always has tacit individual properties, driven by individual frames. The blog was open to the entire company to attract relevant and widespread commentary, thus opening the door for emergent reframing. This enabled new, previously unheard voices to participate in the sense-making process.

Once entered into the blog, the signals were reviewed at a monthly signal review meeting. First, free-form screening was used to prune the long list of all signals from the month, based on relevance and salience, which encouraged group discussion in order to balance the individual bias in saliency assessment. Then the categorization and relevance of each signal was discussed. Initial attempts engaged a review team external to the EWS team. However, this approach was not very successful, so from the second month the EWS team arranged the signal reviews among themselves. Within these signal reviews cycles of experiencing, framing and reframing acts took place, which were aimed at group consensus regarding which signals to highlight.

Four months later in 2006, the Market Alert Newsletter editing and the EWS editing were organized into the same team in the line organization. This lead into a more strongly combined process, which brought operational efficiency by utilizing the same signals in both the scenario follow-up reports and Market Alert newsletters—an important aspect of the CDC. Both the Market Alert blog and the signals follow-up blog were continued, so as to keep both editorial foci and the frames that they maintained intact, but they were tightly linked for EWS purposes.

The EWS team also reviewed signal areas and introduced new categories while less important categories were discarded. Some signal categories were introduced bottom-up, highlighting an issue and attempting a minor reframing to the EWS frame. The EWS team noticed "hot topics" - meaningful but difficult-to-classify events such as the flurry of home environment-related stories that were published when sales of flat-screen TVs skyrocketed. These were grouped and proposed as new EWS categories. One person from the top management team had the role of steering the EWS team on approximately a quarterly basis. Thus, the reframing efforts of the signal team emerged from initial subtle changes into more visible new frames in an effort to give sense to the top management.

In 2006, top management held a follow-up session to the 2005 SP round where they decided to update the existing scenarios framework to keep the scenario thinking current. The goals were to review and update the scenario content, and to harmonize the assumptions for strategy with the updated scenarios. The same scenario teams that were used in 2005 conducted extra sessions to further develop their scenarios, but each team was complemented by new members to enrich the dialogue with their new frames and perspectives, thus opening the door for reframing. Nokia's top management acknowledged the value that individuals with different experience and accompanying frames brought to a conversation with the aim of creating new sensemaking via patterning, framing and reframing and it is noteworthy that one executive of a customer company was invited to participate in one team's effort.

In the follow-up session, both the scenario set and the early warning signal areas were updated, in effect updating the frames that the SP-EWS CDC offered. The quarterly EWS reports that

followed the scenarios were used by all the teams to beef up their scenario stories, thus inviting new experiencing and patterning to take place. So not only did the SP impact the EWS; the EWS also impacted the scenarios. In addition, in an act of "reverse" highlighting, discarded signal areas downplayed some uncertainties in the scenario stories such as "emergence of horizontal technology dominance".

In a brief, concluding top management scenario discussion held in January 2007, the scenario considered most likely in early 2006 (which anticipated horizontal content dominating players), came to be considered only as likely as the scenario that anticipated the emergence of mutually incompatible, competing ecosystems, thus significantly highlighting the issue of mutually competitive ecosystem emergence. Future events proved that this was a necessary reframing of understanding, and in hindsight it would have been wise to continue using the SP-EWS CDC beyond January 2007. This would have helped Nokia's senior managers to better understand the logic of the emergence of competing ecosystems well before the creation of the successful phone app stores and their ecosystems, which emerged when Apple launched its AppStore in mid-2008 [62].

It is clear that in the January 2007 session, management attention was refocused on more salient futures and related uncertainties. EWS had managed to keep the extant SP scenario framework alive by updating and refreshing it for nearly 15 months. The new foci of attention this CDC produced in those 15 months informed Nokia's decision to expand its strategic focus on services to a focus on "services and solutions" (Nokia Form 20-F 2008). This was done to adapt its industry position in a new world where solutions for devices and services, and the ecosystems driving these solutions, rather than the devices themselves, determine success.

Meanwhile, the EWS DC was perceived as a resource for the whole company. In 2007, new intranet channels were opened for Market Alert. Key stories were listed in the Nokia internal intranet homepage. This attracted ever-wider attention, bringing many new voices to the blog process. Hot news and competitor actions remained a core topic for the Newsletter, but the content was broadened to cover Nokia's current domains of strategic ambition, which extended to selected service businesses in addition to the mobile phone business.

4.3   *Cross-case analysis*

In this section, we first overview the performance of these firms, then move onto how each firm converted SP and EWS into DCs and CDCs, and compare the cognitive aspects of sensing in the two companies. Finally we will conduct a short comparison of the technical differences between case company SP-EWS practices.

4.3.1   *On performance outcomes*

Statoil became one of the top three performers among its International Oil Company (IOC) and National Oil Company (NOC) peer groups in ROACE (return on average capital employed) terms, a key industry performance measure as assessed by Barclay Capital. PFC Energy figures showed the production cost level difference to the peer group average also increased in this time period, favoring Statoil [59]. While it is impossible to attribute this success to SP or EWS as so many other factors affect company performance, Statoil's managers were performing well. Their decision to merge with Hydro was helped, as we have illustrated, by the DCs analyzed in this paper, but it is impossible to assess the singular contribution that the DCs made to the success of this initiative.

The situation with Nokia is more complicated: When we started our research it was one of the world's most successful and admired companies, but it has lost this lustre in the interim. Well after the period of our research finished in 2008, and after the second author left Nokia on 11 February 2011, Nokia announced that it was initiating a joint venture with Microsoft to renew its software strategy. Critics suggested that Nokia had missed grasping the importance of the Internet, had been too stuck in its handset-making business mindset to understand the impact of the iPhone or Android-based phones, and had to catch up.

However, based on our research, we believe that Nokia's problem was not due to having the wrong strategic outlook, that is, the wrong framing of key issues. The apparent failure is in how it connected the sensing DCs covered in this paper and the seizing DCs with the reconfiguring DCs (which are beyond the scope of our research). Its apparent inability to integrate superior user interface designs with software and hardware in smart phones represented a failure to seize and reconfigure an architectural innovation [63] because of the success of Nokia's deeply rooted, dominant frame and the working ethos that enacted this frame. Nokia saw the importance of the unfolding Internet and touch screens. Indeed, Nokia installed web browsers in

its smart-phones before anybody else, and did so well before the release of Apple's iPhone. Nokia also released the first touch-screen phone to the market, the Nokia 7710 in 2004, three years before iPhone. When the iPhone was released, multiple touch-screen phones were already in the market.

Regarding alternative frames to that of 'handset maker', Nokia already had developed a well patterned and tested "services" frame at the time when the iPhone was released. The company strategy at that time was: "Nokia needs to stretch beyond devices to services". This frame was manifested when Nokia acquired map maker Navteq in 2007, more than six months before Apple opened its App Store. Nokia went "beyond the device" earlier than Apple, but it did not execute the strategy as well as Apple.

4.3.2   On the evolution from disconnected exercises to DCs
Table 2 summarizes how both SP and EWS in the two cases became sensing DCs. We saw that in both case studies, SP and EWS participants interacted better when engaging in activities that became regular and institutionalized, by developing bespoke blogs and intranet systems dedicated to supporting each SP and EWS. In both firms, these efforts led to the creation of a semi-permanent, yet dynamic and refreshed capability, growing with what initially might have been episodic, one-off initiatives and/or ad-hoc professional activities. In each firm the scenario framework was discussed and related to EWS, and more broadly to CI, framing actions in multiple occasions over the years comprising our research (items 11 and 12).

Table 2 about here

Our research revealed that technologies such as Nokia's newsletters and the network of early warning signal and strategic thinkers (enabled by email, logs, and wikis), and Statoil's bespoke web solution and quarterly meetings, manifested the regularly programmed, stabilized interactions of SP and EWS into a CDC in each firm [52]. The CDC, in addition to linking the SP and EWS DCs, also developed a synergic relationship between SP and EWS with top

management—and more specifically with how they used the sensing CDC to frame their attention.

In this CDC arrangement of relationships, all actors related by the CDC win something important. Firstly, the competitive intelligence EWS DC and its professionals benefit from the "aura of nobility" that the SP DC has for top managers. This is because what the competitive intelligence and EWS track has now been defined by SP patterns and frames that reflect top management interests. Thus, the EWS early warning outputs receive increased attention [36,64] (as depicted in item 15 in table 2). EWS conversations and outputs have highlighted new issues and modified top management frames at Nokia. In the same way, Statoil EWS outputs are systematically used in strategic planning and development cycles.

Secondly, as the similarities in items 11 and 12 show, SP as a DC in turn benefits from the refreshing continuity that the EWS DC offers. The scenarios that SP produce in this situation are no longer limited to a one-off event for top management to use episodically. Instead of products with a short life-in-use, the EWS DC helps scenarios become an ongoing, up-to-date, useful framing process [34,43] that can be engaged regularly and over a longer period of time. This makes the investment in SP efforts longer lasting and thus more attractive. This CDC changes not only the value obtained by SP, but also the nature of the DCs. SP no longer manufactures 'products' in the form of scenario sets; together with the EWS DC it offers a service.

Finally, top management benefits from the complementary insights both SP and EWS offer, more than if it only used either DC alone.

4.3.3   *On the cognitive aspects of sensing DCs*

We have proposed that the sensing DC has six distinct although inter-related aspects. Table 3 outlines how these aspects are manifested in each SP and EWS, and in each of the case study firms.

Table 3 here

First, the table shows that in our case companies, SP enabled management to attend to emerging issues, delivering the 'weak responses' that are initially needed for weak signals [65]. Imagining, experiencing and patterning rendered such issues as unconventional exploration (Statoil) and mobile data pricing decisions (Nokia) communicable. The issues were framed (and reframed) both simultaneously and sequentially, both in the SP group and among EWS participants. Some such issues were highlighted as highly relevant for the company. Highlighting took place by communicating scenarios to the organization, informing strategy work, and directing the categories that EWS uses.

Second, to leverage this organizational attention to newly highlighted scenario issues, the combination of EWS and SP also created an integrative mechanism where related, emerging issues were highlighted to managerial attention from multiple sources, framed mostly via scenarios, but occasionally beyond them. While doing so, the EWS participants engaged in intensive experiencing, framing, reframing and highlighting, also with some occasional patterning. Thus the integrative mechanism acted as a cross-divisional channel for sensing [66].

Third, SP-EWS CDC helped both of our case companies to apply multiple frames-as-scenarios for multiple interpretations of the importance of emerging issues, not just the interpretation driven by the dominant frame. Indeed, both case studies provide evidence that the EWS – SP CDC explicitly challenges dominant frames, invites attention to what had been considered peripheral (for example, climate change in Statoil, or the importance seizing architectural innovations in Nokia) and helps these new strategic framings redirect managerial attention. This leads us to suggest that the quality of a company's sensing DC can (at least partially) be measured by how often the dominant framing is surfaced and questioned, and which alternative frames can redirect the attention.

Finally, SP and EWS established a stream of successive framing and highlighting events. Several framings over time gave rich meaning to issues. Thereby existing issues evolved and new issues emerged, keeping and gradually shifting the attention with evolving interpretations.

4.3.4   On technical differences in the process
There are some differences between both cases that are worth noting. Nokia used four scenarios, and whereas Statoil started with four, they merged two and worked with three from

2006. Statoil avoided the 'expected/best/worst' categorizations often associated with three scenarios by making the three very different according to several criteria. To avoid biases, Nokia had an adjustment mechanism for EWS categories, whereas in Statoil the biases were attended to in analysis meetings involving external 'category experts'. Nokia's active blogging culture was not visible in Statoil for competitive intelligence or EWS. Instead Statoil developed a bespoke web-based system to share and store signals, interpretation and analysis reports. Both firms, however, used quarterly unfolding analysis meetings. This may be surprising given the different paces in industry change, typically spanning months in telecommunications and decades in the oil industry. We feel that this regularity has more to do with how quickly management attention can be distracted and how regularly it has to be refreshed than with industry characteristics.

5   Limitations of this research and implications for scholarship

Our research is limited to the sensing DCs Teece proposed, and does not cover the seizing and reconfiguration DCs that complement sensing. As it is upon joining all three DCs together that managers extract value from such capabilities, our research does not offer evidence of the gains that firms obtain from such combinations.

In studying the sensing DCs of both firms, we compare SP and EWS processes that are joined in a similar manner. We also researched two cases where the links worked well with each other. We do not have cases where the links we studied were not attempted—or were attempted and failed to work synergistically.

Our research is based on on-site experiences in each firm by the authors and is thus mostly retrospective. To address some of the possible biases this entailed, a small number of key interviews in each location was undertaken and the information thus obtained was triangulated with available documentation. A limitation is that the level of granularity that this research approach offers is more limited than that which future researchers wanting to study these DCs could obtain with alternative approaches (such as questionnaires, ethnography, or a strategy process research approach). Also, both of our case study subjects are large, Nordic firms. It is unclear if our findings apply to firms in other contexts. The tentative findings we offer are at a mid-level between the single case study and general application, and must be taken as exploratory only.

6   Discussion and concluding remarks

Schoemaker was the first to show how SP can help correct framing biases [67]. As Teece put it: "*Fortunately, biases can be recognised ahead of time. Enterprises can bring discipline to purge bias, delusion, deception, and hubris. The development of disciplines to do so is still in its infancy. The implementation of procedures to overcome decision-making biases in enterprise settings is accordingly not yet a well-distributed skill, and may not be for decades to come. Accordingly competitive advantage can be gained by early adopters of techniques to overcome decision biases and errors*" [68 p.31]. Our analysis of two cases shows that this skill, while possibly still 'not yet well distributed', is already present as a sensing DC in some firms, centered around acts of constructive, successive interactions of framing, reframing and highlighting.

In this paper we have shown that the SP and EWS sensing DCs help to frame and reframe managerial attention. Our cases show how SP and EWS can be made to reinforce each other in synchronous and asynchronous activities. They alone and together relate participants' individual attention frames with group sensemaking and sensegiving. The framing and reframing they offer, and the highlights they suggest, direct and redirect managerial attention to help with seizing issues and preparing reconfiguration decisions. This sensing thus facilitates the role of scenarios in decision-making explored by Wright and Cairns [69].

Because SP offers at least two frames, SP helps to surface the extant dominant frame and helps to compare it with equally plausible alternatives. If factions in a management team have been holding incompatible views on an issue, SP helps to identify which frame each team member uses and, coupled with EWS categories, helps them to determine in which settings one frame might be more applicable over another. In this way the SP – EWS CDC can help portray disagreements as a productive asset and not a liability to be eradicated.

We have shown that by reorienting managerial attention, the EWS – SP combination supports van der Heijden's famous dictum that scenarios improve the quality of strategic conversations. And because they enhance the way different individuals can make sense of their unfolding

environments, the SP-EWS CDC also supports the transformation Hodgkinson and Healey described as changing group perceptions [16].

Considering SP and EWS as DCs prevents them from becoming overly institutionalized and bureaucratic, 'frozen' into departments with budgets, remits, targets, and so on, which enhance dynamic conservatism [70]. These capabilities appear to work best when they themselves remain open to change, and while reasonably stable and embedded in replicable processes, can remain fluid, dynamic, and ever-changing [71].

Beyond showing how both SP and EWS can be considered as DCs, and the impact this has on improved scholarly understanding of how they interact and support each other, our research also holds value for practitioners. It proposes that linking EWS with SP increases the effectiveness of each and enhances the return on the investments they represent. It offers several empirical metrics (number of frames explicitly surfaced, considered and changed; number of EWS new and dropped categories; number of new issues highlighted per year; etc) by which the improved capability for unbiased (or less biased) sensing can be ascertained, and return for the investments in SP and EWS can be measured. These metrics can also measure the quality of the strategic conversations, which van der Heijden proposed as a reason to invest in SP, thus rendering his proposition to be more easily established empirically.

We are aware that sensing DCs are also being developed in governmental departments in Asia and Europe and believe that the use of these to enhance the effectiveness of redirecting management attention in turbulent environments [71] will grow in the future. We thus believe our research on DCs in this area will spawn further cases that will extend and refine our analyses.

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