

# **Embedding Foresight in Business Intelligence**

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**Authors' copy of the book chapter**

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## **1.0 Introduction**

Nobody knows the future, but everyone wants a slice of the pie. Back in 1985, before the popularity of personal computers as business machines, the idea of a paperless office was just a glimmer on the distant horizon. At a fledgling company in America, an ambitious young executive with a hunch decided that paper should be handled electronically, but he did not have ten million dollars to spend on R&D. He had guessed correctly that in a world of mainframes, where microcomputers were still being viewed as novelties, this view would change in the near future and impact global commerce. Armed with the knowledge that being first to market often translates into competitive advantage, he hired a small team of software engineers on shoe string budget. Six months later, the paperless office system went online in Chicago, Detroit, and Los Angeles. Within a year, it was implemented in all the company's regional offices scattered throughout the USA. Today, the firm is a multi-national corporation enjoying a formidable

market share.

The lessons learned from this story are two-fold: 1) With electronic files of customer data at their fingertips in an information system (IS) that was fast and easy to use, office personnel viewed the personal computer as a useful tool on their desks. The IS had no special status and did not burden the workers with extra tasks. Hence, it became embedded in their work roles, providing the human actors with a rich data source and the means to communicate about complex business processes between all levels of the organization. As a result, the firm was able to offer superior customer service, resulting in an annual 45% increase in revenues, which continued over the years, propelling the firm to the ranks of a Fortune 500 Company. 2) Saving money by investing in a cheap new technology was a risk, but the potential benefits outweighed the opportunity cost. The young executive's idea that an agile company can adapt to change and transform it into competitive advantage, suggests that foresight, which involves viewing the future to support long-term planning, is a desirable business activity that firms should adopt.

As educators and practitioners, the authors are interested in how to create and develop this kind of agile growth companies. They have noticed that business intelligence (BI) is often focused on short-term operative decision-making. At the same time, the authors have envisioned that BI also has potential to provide companies with a better understanding of the future business environment for long-term planning. After conducting a systematic literature review of studies that combine foresight and BI, based on several search queries, analysis of abstracts and full texts in four databases (Academic Search Premiere, Business Source Complete, Springer Link, and Science Direct), the authors arrived at the first conclusion of this study: peer-reviewed research combining foresight and BI is extremely scarce.

Instead of leaving it there, the authors decided to continue with a conceptual study by taking a closer look at the studies currently at hand. By reviewing the initial findings on the topic, the authors contribute to the BI literature by showcasing how foresight can be embedded in BI, what the requirements are from a management perspective, and how business intelligence systems (BIS) can be designed to effectively enable analyzing future events impacting a company.

Empowered by these ideas, the following research questions were asked:

Q1: How do companies conduct BI foresight activities?

Q2: How do companies recognize subtle changes in the external environment, which could impact their long-term planning or disrupt their position in the market place at some point in the future?

Q3: Is there a way to implement BIS and embed foresight across an entire organization to facilitate the detection of future changes and support long-term strategic decision-making?

The authors present the results of the literature review and their answers to the research questions in the succeeding chapters. First, they discuss how companies conduct BI and foresight activities, and present potential sources of failure to do those successfully. Second, they share insight on how companies can collect data to identify changes in the external environment. Third, the authors move on to discuss how foresight can be embedded in the mindset of a firm using BI and IT tools to facilitate the detection of future changes and support long-term strategic decision-making. In the conclusions section, the authors sum up the findings of their literature review, and identify the themes that are crucial to the success of BI foresight activities in the firm.

## **2.0 Business intelligence and foresight in the firm**

In order for a company to sustain growth in the post-modern world of global commerce, discerning trends and areas for future expansion are critical to support decision-making and prevent the loss of market share. Köseoglu, Ross, and Okumus (2016) provide a summary of definitions and for the purposes of this study, the viewpoints that perceive BI as a strategic tool, which enables management to identify propulsive forces and foresee changes in the external environment by transforming of raw data into competitive intelligence to support business decisions, have been adopted.

Rohrbeck and Schwarts (2013) identify three foresight activities that translate into competitive advantage for the firm, described in the following table:

- Insert Table 1 approximately here -

BI foresight activities begin with management requiring intelligence data for long-term strategic planning. Project parameters define what type of external data should be collected, for example, patent data to support decisions regarding product innovation or market data to look for emerging consumer buying habits. Once the parameters have been established, the data can be collected and analyzed. Based on the analysis, there may be recommendations for making changes within the company, such as scaling back or gearing up product development in one area to prepare for shifts in the market place. The final step is the dissemination of the recommendations to executive management for decision support.

In some companies, decision-makers participate in the entire process. These BI foresight activities in the firm comprise the entire field of *corporate foresight*, which is an emerging field in the peer-reviewed literature. According to survey by Hammoud and Nash (2014, p. 11), “The top five ways participants mentioned that foresight helped the corporation were in shaping the future, improving corporate changeability or flexibility, enhancing organizational alignment,

improving the customers' perception of the company, and creating an awareness of new opportunities.”

As far back as 1979, Fowler realized that the role of the IT department in decision support systems should be providing inquiries, not answers. They illustrate an HMO executive, who delighted in querying the database, and conclude that filtering data should be done by the decision-maker because only he/she can correlate subtle relationships. Patton (2005) likewise confirms that a leader in top management should focus on continuous scanning of the environment and participate in decision-making. More recently, Mayer, Steineke, Quick and Weitzel (2013) propose incorporating the use of IT for gathering raw data, then disseminating the resulting information to executive decision-making.

Eastburn and Boland (2015) caution against becoming too comfortable with ways of analyzing big data when looking for subtle clues to changes in the environment. They report that overreliance on IS causes people to miss clues in the data representing circumstances that they are not prepared to deal with. In their case study of the banking industry, two key factors associated with intelligence failure were uncovered:

- **Organizational mindlessness**, defined as the tendency of management to engage in routine activities, wrongly attributing data anomalies as normal variations, and failure to think outside the box.
- **Rigidity of organizational routines**, where enterprises fail to incorporate creativity because the established structure does not allow flexibility;

They recommend instilling a policy of *mindfulness* to reduce the frequency and likelihood of *surprise* catching a firm completely off guard.

Numerous studies indicate that without the organized support involving specific stakeholders, BI foresight activities may be conducted sporadically, which can result in failure. Urbany and Montgomery (1998) report that proactive firms improve their success rate through the practice of adopting competitors, where the adoption team is a group of executives tasked with studying the competitor and assessing risks or threats. Membership on the team continues throughout the executives' careers in order to provide a steady stream of insight about the competitor's behavior.

The inability to prepare for change is another type of BI foresight failure associated with insufficient organizational support and it primarily occurs in firms which lack agility. Rohrbeck and Schwartz (2013) found that scenario planning and road mapping are activities which can foster collaboration within a firm to facilitate change. In large organizations with complex internal business processes, change usually requires a shift to new procedures, which middle managers may resist as they cling to legacy incentive systems. Research findings indicate that companies enjoy improved performance in foresight initiatives when middle managers are included (Rohrbeck and Schwartz, 2015) and communication between employees is supported (Muntean, Cabău and Rînciog, 2014).

A good example of how communications failure can lead to disaster is described by Cunha, Clegg and Kamoche (2012) in their study of real-time foresight. They found that valuable insights can originate with employees at any level of the organization and this information should not be overlooked by management, who may be focused on a single area and not paying attention to other external forces. Communication and collaboration within a firm as a pillar of intelligence success was also studied by Hammound and Nash (2014), who published the top methods used by foresight practitioners in a variety of enterprises:

- Insert Table 2 approximately here -

Firms adopting an enterprise-wide holistic approach empower key stakeholders with new ways of thinking to expand the firm's memory of the future (Rohrbeck, Thom and Arnold, 2015). Scenario planning and constructing road maps are participatory exercises which identify possible futures that people remember. Altogether, this becomes the firm's collective future memory. Rohrbeck and Schwartz (2015, p. 16) conclude: "The more memories of the future that are stored, the more receptive can an individual be to signals from the outside world."

In support of a holistic approach that embeds foresight in BI, Graefe, Luckner, and Weinhardt (2010) advocate developing "a continuous observation of possible future developments, challenges and opportunities" (p.395), which requires a shift in how companies manage their strategy portfolio. Their study concludes that one-off activities, such as forecasting, strategic planning or scenario techniques, must be replaced by comprehensive foresight with a timely response in order to achieve competent strategic issues management.

The argument for developing a comprehensive and effective means of instilling foresight systematically throughout an enterprise is compelling. Research indicates that BI foresight has given rise to the terminology of competitive intelligence (CI), which is gaining a strong foothold in large commercial enterprises as a result of leadership recognizing how actionable intelligence enhances a firm's competitive advantage (Prescott and Miree, 2015) .

### **3.0 Collecting data to identify changes in the external environment**

Fundamental to the concept of BI iforesight is the analysis of data from external sources which should include a wide range of industries because game-changing events often come from a different industrial sector than what the company is currently engaged in, particularly in the

area of technological change (Du Preez and Pistorius, 1999). The following table summarizes the type of external data companies typically collect:

- Insert Table 3 approximately here -

BI professionals and organizations who engage in foresight activities must be vigilant in discerning information from the periphery because it is here that warnings and environmental shifts, i.e., weak signals, may be detected (Calof and Wright, 2008). Patton (2005) identifies six characteristics associated with weak signals:

- Signals of change;
- Discontinuities;
- Outliers (events or developments that are off the current trend line);
- Items that defy conventional wisdom;
- Inflection points;
- Disruptive developments or technologies.

In their literature review of scanning systems, Mayer et al. (2013) summarize three models: early warning systems (Cohen and Zinbarg, 1967); weak signals (Ansoff, 1975); and second generation environmental scanning Systems (ESS) (Davies et al., 2005). Our research suggests that contemporary methods employ all three models.

Palomino, Taylor and Owen (2013) suggest that organizations need to develop ways to automate scanning for better performance. They developed and tested a semi-automated horizon scanning system, which provides daily scans and a feedback loop to improve quality:

- Insert Figure 1 approximately here -

Mayer et al. (2013), in turn, developed the 360° corporate radar which scans all aspects of the horizon to zero in on specific target areas with the greatest potential impact. The external

environment is split into two parts: 1) the task environment, generally associated with a value chain consisting of suppliers, customers, and competitors; and 2) the general environment, which focuses on indirect impacts over the long term by detecting changes in the economic, political, social, and legal or regulatory climate, along with nascent developments in the technology sectors. When signals are detected, indicators, based on lead time, clarity, and cost/impact ratio are identified-using an IS to perform analysis by incorporating semantic search and data mining.

Patton (2015) found that most companies have insufficient expertise and resources to perform the actual task of scanning, yet it is precisely this task and the ability of an organization to embrace rapid change which are essential for survival in a highly competitive global marketplace. He concludes that consulting firms may facilitate the scanning process and describes a case study of the SRI Consulting Business Intelligence (SRIC-BI), which hosts periodic meetings where the participants examine 100 abstracts created by experienced SRIC-BI employees. These abstracts contain indicators of change not on any known development trajectory, which participants are free to discuss without feeling restricted by a specific company culture. SRIC-BI publishes monthly reports that provide a “push – pull” mechanism intended to spur BI activities in the companies who receive them by providing data on an as-needed basis, along with information not usually on the corporate radar.

Despite the critical importance of environmental scanning, this research indicates that companies struggle to achieve good results because organization competence in detecting weak signals is dismal (Petrișor and Strain, 2013). Less than 40% of surveyed corporate respondents reported satisfaction with *external* data reliability and consistency, compared to 75% who mined *internal* data (Isik, Jones and Sidorova, 2011).

The failure of an organization's ability to accurately detect changes in the environment and use BI foresight to improve competitive advantage occupies a small space in the literature. The definitive study by Fleisher and Wright (2010) identifies four levels of failure concerning data gathering and analysis within the firm as well as external environmental failure. The authors suggest the model proposed by Fleisher and Wright correlates to the four domains identified by Lyytinen and Hirschheim (1987) in their seminal study of general IS failure. Yet, research integrating these concepts is not prevalent in the BI foresight or CI literature.

Calof and Wright (2008) suggest that recognizing CI as separate field of research warrants a more thorough approach. They observe how many of the concepts overlap other heavily researched areas, including knowledge management, foresight, strategy, and business analytics. Petrișor and Strain (2013) also confirm that BI foresight studies which focus on competitive advantage for the firm are sparse. They suggest that insight is a core competency of the intelligence domain, but areas including risk assessment, war gaming, state-gate analysis, blue ocean strategy, and early warning are not fully integrated in the academic literature. Their recommendation that both practitioners and academic researchers need to include *intelligence* in their concept of using CI is supported by Harvey and Jones (1992), who blame the focus of business schools and the lack of courses which teach intelligence as the main reason companies cannot stay afloat in the global market place.

Finding ways to improve the performance of environmental scanning and analyzing data to support decision-making in order to react to changes in the rapidly changing global market place requires a multi-level approach. In the foregoing discussion, two themes emerged which empower these activities: 1) *support of top management, along with active participation at all*

*levels within the organization and 2) the IS must be positioned to avoid over-reliance on IT, which can result in mindlessness.*

The argument for developing a comprehensive and effective means of instilling BI foresight systematically throughout an enterprise is compelling. With the advent of knowledge and expert systems to facilitate communication and information sharing, the authors endeavored to find out whether specially designed IT tools can also support BI foresight activities to produce more positive outcomes and reinforce a state of mindfulness throughout an organization.

#### **4.0 Embedding foresight in the mindset of a firm using business intelligence and IT tools**

According to Rohrbeck, Thom and Arnold (2015), companies are scrambling to evolve their information and communications technology (ICT) in order to take advantage of their data assets to aid in decision-making. They surmise that the volume and diversity of data is large, but the most effective interpreters of this data are top managers, whose time constraints do not allow them to analyze raw data. This view is supported by Kuilboer, Ashrafi, and Lee (2016, p.4), who conclude, “To optimize benefits, BI solutions have to be aligned with the organization’s goals and deployed properly. In addition, the structure of the organization needs to allow data-driven decision-making. Otherwise, the results extracted from BI solutions will not make a difference and the organization will resist the suggested course of action.”

A study by Grublješič and Jaklič (2015) confirms that unless computer support for BI foresight activities is viewed as an embedded tool by decision-makers, it will not be effectively utilized. They suggest that firms which are market-oriented tend to use these tools more readily as their focus is on growth and rewarding employee performance encourages personal innovation. Their study reinforces prior research by Shanks, Bekmamedova, Adam, and Daly,

(2012, p.1), who found that an organization should strive for “BI-driven decision-making routines and BI-enabled organizational processes that take managerial decision making to new levels of understanding and foresight.”

In this study, two views on embedding BIS were discovered: 1) developing BI activities throughout the firm in a creative manner to encourage employee participation and 2) reinforcing foresight activities within the business information system (BIS). Based on these findings, the authors consider that a BIS which successfully supports BI activities must include both views.

Grublješič, T., and Jaklič, J. (2015) found that in order for a BIS to be effective, three dimensions must be present:

- **Intensity:** what a person thinks when using the BIS and how absorbed he/she is in this activity;
- **Extent:** how the user engages the BIS to perform work and to what extent;
- **Embeddedness:** the person uses the BIS as a tool to perform work, i.e., the BIS has no special status and the purpose of the BIS is to facilitate the person in his/her work role.

Furthermore, a culture of information openness must exist at all levels of the enterprise. This requires transparency in gathering and disseminating information along with reporting errors and failures. Quality of the data and ease of use play important roles in determining whether people will use the BIS or try to avoid it. Critical to user acceptance is the design and capability of the user interface, for example, dashboards and the ability to print custom reports. Finally, companies who actively seek competitive advantage are more likely to embed BIS because they place a high value on CI.

Although the contemporary marketplace offers a rich variety of software tools for big data analytics, which are useful in short-term forecasting, user-friendly apps which combine foresight

with the powerful data manipulation of BIS seem to be missing from the pack. According to von der Gracht, Bañuls, Turoff, Skulimowski, and Gordon (2015, p.1), “The foresight discipline applies more than 30 different techniques to obtain valid and profound conclusions about future developments and scenarios. Until now, only a few of these techniques have been transferred into reliable software applications.” Five objectives of a foresight support system (FSS) are identified in the table below:

- Insert Table 4 approximately here -.

Rather than encouraging custom applications, von der Gracht et al. (2015) advocate selecting individual software modules from commercially available FSS so organizations can implement those most appropriate for their specific needs. This kind of BIS is already in use at Deutsche Telecomm and is showcased in the following.

In a case study of Deutsche Telecomm, Rohrbeck, Thom and Arnold (2015) identified barriers in the BI foresight process that inhibit change. These barriers are largely focused on collecting external data and recognizing indicators of forthcoming environmental shifts. The BI foresight activities and human actors associated with each barrier are illustrated below:

- Insert Figure 2 approximately here -

Their study concludes that an IS designed to overcome the barriers of data collection, recognition of key indicators, and facilitate enterprise-wide BI foresight activities should incorporate three *enablers*:

- **Data Gathering:** enabling a large number of contributors from inside and outside the organization to share information (ideas, observations, insights, etc.), the IT tools being particularly useful for handling a large quantity of information;

- **Interpretation:** enabling multiple stakeholders to assess and judge information from their perspectives and to participate in a dialogue with other stakeholders;
- **Organizational Response:** enabling follow up activities, particularly with innovation management through a direct process link.

They describe a working solution at Deutsche Telecomm built on a tri-tier ICT platform that satisfies all three enablers:

- **A database and workflow tool** *for scouting and assessment of developments and trends coming from markets and technology (PEACOO Scouting Tool);*
- **An idea generation and management system** *building on impulses coming from technology and market intelligence (PEACOO Gate 0.5);*
- **An Intranet portal** *for making insights available to every DT employee and for crowdsourcing additional information and opinions (Foresight Landing Page).*

The system interfaces are illustrated below:

- Insert Figure 3 approximately here -

The system design encourages collaboration, which improves the detection and management of weak signals, fosters creative thinking and continuity throughout the BI foresight process, provides formal tools for decision-making, enriches archiving knowledge by linking first detection of a signal to future outcomes as users add their updates, and potentially bridges the gap between the planned outcome and the actual response taken by the firm. Rohrbeck, Thom and Arnold observe that when these activities generate enough “noise” in the organization, it gets the attention of top management. They conclude that employee participation in the steps which leads to decision-making spurs motivation and commitment. Finally, because the system is used

as part of the daily work routine, the BI foresight activities become fully embedded in the mindset and operations of the firm.

## **5.0 Concluding remarks**

The literature specific to BI and corporate foresight is scarce. The majority of research focus on competitive advantage in specific areas, such as technological forecasting, or simply lack any mention of foresight. On the other hand, scholars and practitioners who view corporate foresight as an emerging field include Ruff (2006), Rohrbeck, Battistella and Huizingh (2015), and Köseoglu, Ross and Okumus (2016),

By putting all the pieces of the puzzle together from the articles in the literature review, the authors identified two themes crucial to the success of BI foresight activities in the firm:

- Support of top management and active participation in BI activities throughout the enterprise;
- The IS must be positioned to avoid over-reliance on IT and a mindless approach to data analysis.

Empowered by these observations, the authors investigated how BI foresight may be embedded in a company culture, utilized in daily activities by human actors in their work roles, and determined whether specially designed IT tools past the experimental stage can be successfully implement in the firm. One system meets these criteria: the case study by Rorhbeck, Thom and Arnold (2015) at Deutsche Telecomm.

The results of this study suggest that detection of weak signals or shifts in the periphery of the horizon during environmental scanning is difficult. BI foresight activities in many companies are not well managed or simply do not exist. In particular, the topic of BI foresight in SMEs is

under-researched. Yet it is precisely these activities that companies must embrace in order to achieve competitive advantage in the global market place.

The limitations of this study are based on the search methods and defining the scope to BI foresight activities in the firm to discover how these activities may be embedded into the daily work roles of the human actors. The BIS is positioned as an ordinary tool to facilitate BI foresight activities, which means it has neither special status nor poses a burden to the people who use it. The authors did not include published books in this study, although a handful are now being used in academic courses and serve as guidelines for interested practitioners.

In sorting the wheat from the chaff, the authors found that BI foresight in commercial enterprises warrants recognition as a subject for research because the motivation and goals of these organizations are considerably different than the public sector. Furthermore, several studies suggest that BI foresight in the firm may be viewed in the context of CI, which requires an interdisciplinary approach, drawing from fields which include marketing, strategic and innovation management, futures studies, enterprise architecture and IT governance, advanced resource planning, and knowledge work informatics. The idea of embedding BI foresight throughout an organization using IT tools suggests incorporating *IT-reliant work systems theory* (Alter, 2010), along with frameworks by Markku Nurminen (1997) and other scholars who have investigated embedding knowledge management systems in the workplace. With these thoughts in mind, the authors suggest that BI foresight and IT tools form the basis of successful long-term planning in the firm and invite many opportunities for future research.

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## TABLES

Table 1: Potential value contributions of strategic foresight activities  
Source: Rohrbeck and Schwarz, 2014, p.8

Group	Potential
<i>Perception</i>	<ul style="list-style-type: none"> <li>• Gaining insights into changes in the environment</li> <li>• Contributing to a reduction of uncertainty (e.g. through identification of disruption)</li> <li>• Fostering conversations about the overall strategy of the company</li> </ul>
Interpretation and usage (for strategic management)	<ul style="list-style-type: none"> <li>• Support the adjustment of the company in situations of uncertainty</li> <li>• Improving the coordination of business objectives</li> <li>• Creating the ability to adopt alternative perspectives</li> </ul>
Interpretation and usage (for innovation management)	<ul style="list-style-type: none"> <li>• Reducing the level of uncertainty in R&amp;D projects</li> <li>• Enhancing the understanding of customer needs</li> <li>• Identifying potential customers</li> <li>• Enhancing the understanding of the market</li> <li>• Identification of the opportunities and threats regarding our product and technology portfolio</li> </ul>
Overall	<ul style="list-style-type: none"> <li>• Facilitating organization learning</li> <li>• Shaping the future (e.g. through influencing other parties, such as politics and other companies)</li> </ul>

Table 2: Top interview responses for method  
Source: Hammoud and Nash, 2014, p. 6

Codes/subthemes	Example Responses
External experts	<i>Outside consultants conduct primary research and develop trends; moving company from understanding future to actually making investment decisions; serve department-specific needs.</i>
Scenario	<i>"Creating Leading Questions" to identify key topics; Deductive Scenarios for strategy; Inductive Scenarios for research; develop story describing future based on identified signals of change.</i>
Trends	<i>Trends Monitoring (or scouting) to understand developments in macro-environment; Big-Trends: clusters of smaller trends (5–10) with significance; Trend Analysis projects only 2–3 years.</i>
Scanning	<i>Looking for signals of change (new developments, directional, trends, and discontinuity on the horizon).</i>
STEEP	<i>Gauging external environments; VSTEEP: STEEP factors -emergent activities across the factors become a Big-Trend.</i>
Workshop	<i>Facilitate ideation (internal for discovery or presentation); or innovation: held in various locales/customer sites around globe.</i>

Table 3: Examples of the sources of information  
 Source: Du Preez and Pistorius, 1999, p. 222

Published sources

- Annual company reports
- Articles in the business press / technical journals
- Electronic databases
- Company brochures and internal newsletters
- Announcements of new equipment, facilities, or other resource commitments
- Patent awards
- Advertising literature
- Symposium of conference proceedings
- Reports of government agencies
- Professional society reports
- Internet homepages of organizations
- Other internet resources

Unpublished sources

- Speeches by management or other key players
- Expert opinions
- Reverse engineering and benchmarking
- Industry contacts and friends
- Trade shows, exhibition, tours, or conferences
- Court appearances, testimony, lawsuits, and antitrust information
- Customers
- Suppliers
- Unions
- Subcontractors

Table 4: FSS attributes: objectives and required actions  
 Source: von der Gracht, Bañuls, Turoff, Skulimowski and Gordon (2015)

FORSIGHT SUPPORT SYSTEM OBJECTIVES	
OBJECTIVE	REQUIRED ACTION
Identify changes in the business environment	Ensure transparency and consistency of foresight results
Utilize large volumes of statistical and qualitative data	Support efficient handling and assessment
Convince decision-makers about the relevance of changes	Facilitates communication that enables collaboration
Plan strategies	Provide a structure for decision modelling
Act in the changing business environment	Provide rules of order in foresight processes

**FIGURES**

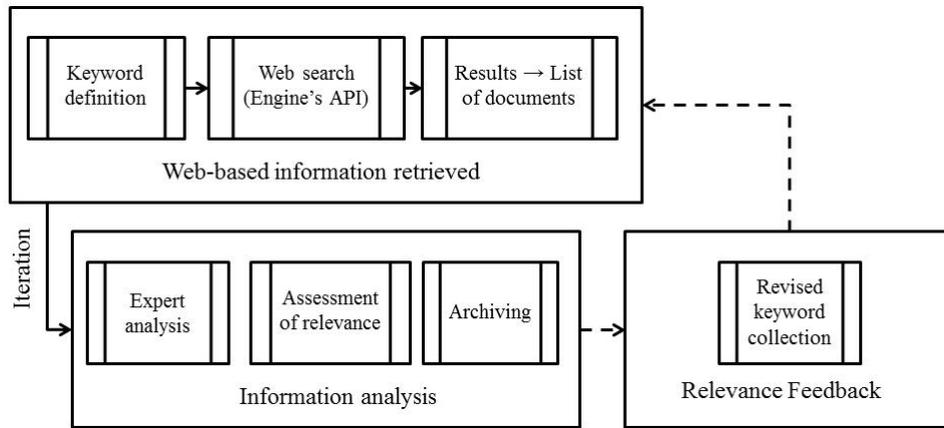


Figure 1: A generalized Web-based horizon scanning approach using relevance feedback  
 Source: Palomino, Taylor and Owen, 2013, p. 358

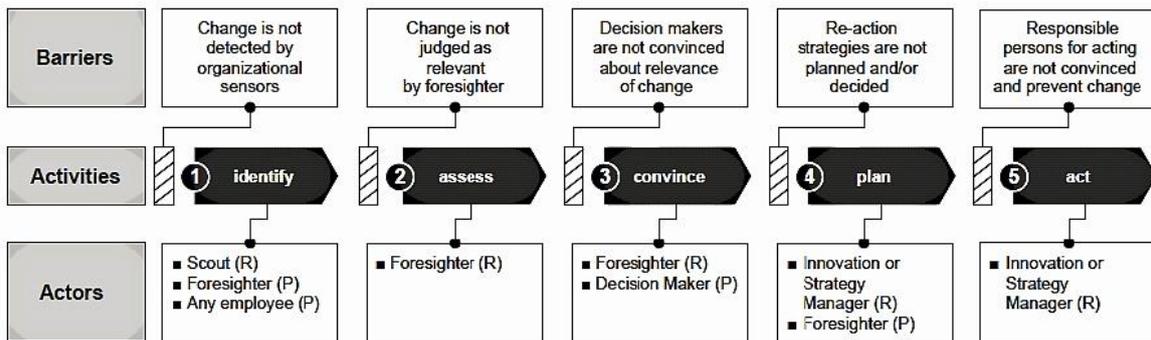


Figure 2: Foresight process with barriers, activities, and actors  
 Source: Rohrbeck, Thom, and Arnold, 2015, p. 5

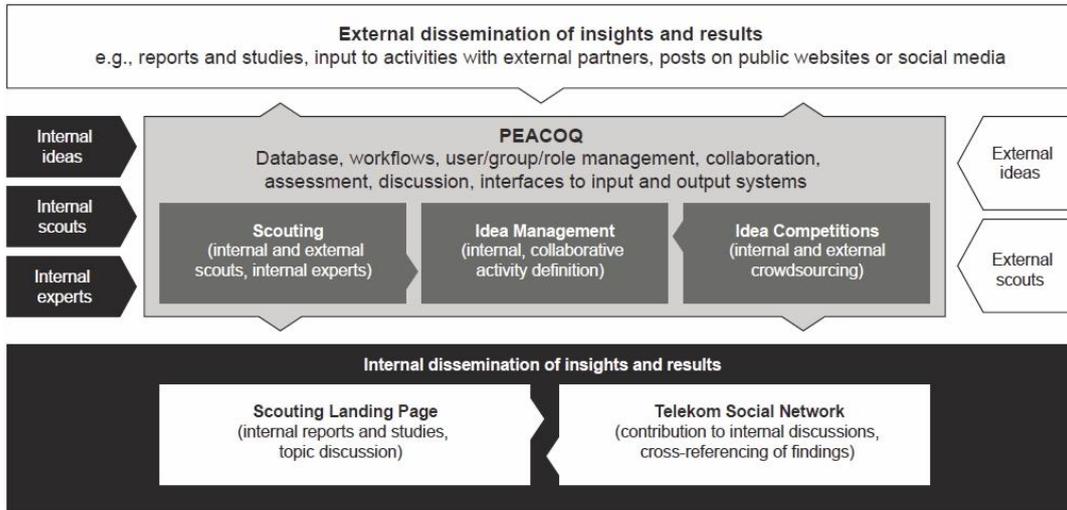


Figure 3: Purposes and interfaces of T-Labs foresight tools

Source: Rohrbeck, Thom and Arnold, 2013, p. 17

