European Commission

*Foresight*

# Models of Horizon Scanning

## How to integrate Horizon Scanning into European Research and Innovation Policies



*Research and Innovation*

**EUROPEAN COMMISSION**

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## *How to integrate Horizon Scanning into European Research and Innovation Policies*

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# EXECUTIVE SUMMARY/POLICY BRIEF

Forward-looking activities aim to better anticipate future opportunities or threats, and to identify issues that are of major importance for the future and the present. Debates about future issues help to understand what is relevant and what can be ignored now. Horizon Scanning has an important role in forward-looking activities: it serves to explore futures, 'emerging issues' and signals of all kinds, and to evaluate the importance of 'things to come'.

During the last few years, different 'Models of Horizon Scanning' have been developed; method-combinations have been tested and implemented. Specific 'Horizon Scanning' institutions have been set up in some countries. Horizon Scanning (HS) approaches mainly serve to enhance resilient policy-making, address policy makers' needs and concerns regarding new issues, to identify business opportunities by anticipating consumer and societal needs or to prepare society for less expected or rapid changes.

## Definition of Horizon Scanning

*Horizon Scanning is the systematic outlook to detect early signs of potentially important developments. These can be weak (or early) signals, trends, wild cards or other developments, persistent problems, risks and threats, including matters at the margins of current thinking that challenge past assumptions. Horizon Scanning can be completely explorative and open or be a limited search for information in a specific field based on the objectives of the respective projects or tasks. It seeks to determine what is constant, what may change, and what is constantly changing in the time horizon under analysis. A set of criteria is used in the searching and/ or filtering process. The time horizon can be short-, medium- or long-term.*

Horizon scanning can complement traditional planning processes and may combine different approaches, such as the search for weak signals, emerging issues, anticipatory signals, and interdependencies.

Horizon Scanning is often based on desk research, helping to develop the big picture behind the issues to be examined. It can also be undertaken by small groups of experts who share their perspectives and knowledge with each other so as to 'scan' how new phenomena might influence the future. A solid 'scan of the horizon' can provide the background to develop strategies for anticipating future developments and thereby 'gain' lead time. It can also be a way to identify and pre-assess assumptions about the future to feed into a scenario development process.

There is considerable experience with Horizon Scanning dispersed in different countries, different organisations and institutions. New techniques are continuously experimented with. Often, the activities are named differently or are performed under different headings. The purpose of this study is to gain an overview of the latest developments, to identify good practices and draw lessons for Science, Technology and Innovation Horizon Scanning in the European Commission.

There is no one-size-fits-all Horizon Scanning model for the European Commission. The 'optimal' choice of a model depends a lot on the objectives and what the 'customers' in the European institutions really need. At the start of a Horizon Scanning exercise, choices have to be made (some are shown in figure 1E). The most important choices concern the objectives and the scanning approach.

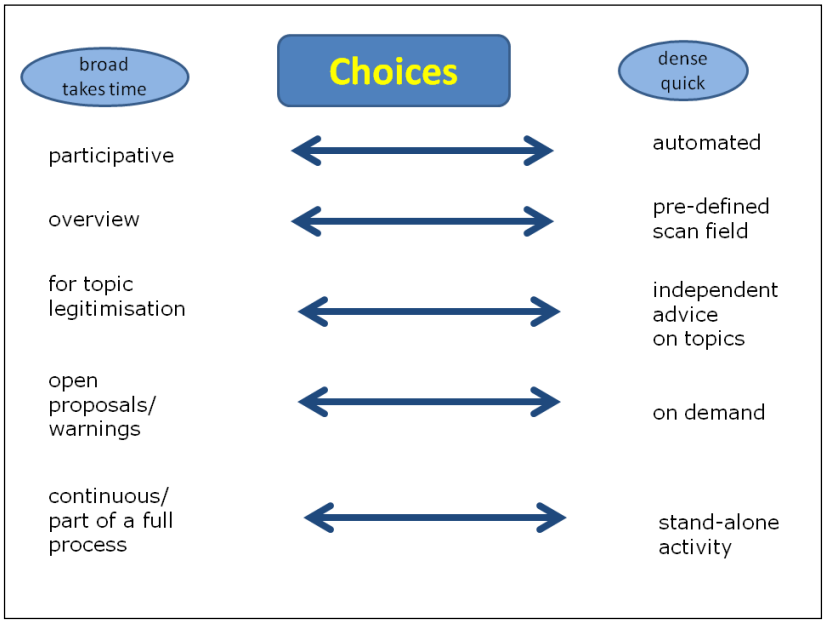



Figure 1E: Choices when deciding for a Horizon Scanning model

Horizon Scanning does not necessarily include consultation with the public or the users. **Continuous** scanning activities to keep the overview (often with regular newsletters), **regular but discontinuous** activities (e.g. every five years) and **ad-hoc** Horizon Scanning for a specific purpose, on demand or at a specific occasion are possible. Stand-alone Horizon Scanning often **concentrates on rather quick answers**. But also larger stand-alone Horizon Scanning for overview purposes is possible. On the other hand, in full foresight processes, the first phase is always a Horizon Scanning phase.

## Recommendations for the European Commission

### A clear organisational structure for Horizon Scanning is needed, addressing functions of coordination and brokerage with users.

A crucial point for bringing useful Horizon Scanning results into the policy-making context is the transfer of these results to sense-making procedures, to assess whether the new ideas or warnings are related to the European Commission and what is to be done with the results. There must be a clear way how information (about risks or opportunities) is transferred and how it can be used as *knowledge*. A brokering function needs to be organized to ensure that the key observations and conclusions can be exploited and reacted to. A nice format of the results adapted to the users' needs is helpful – but it must be target-oriented and match the users' attention level.

There are different locations in the EU institutions where Horizon Scanning is already performed or HS results from other institutions enter the EU system. In order to generate new HS information on the one hand and guide the results to the proper users or sense-making entity on the other, it could be appropriate to join forces, within the European Commission (building on competencies in the EPSC[1], DG RTD, DG CNECT, and the JRC) and across the EU institutions under the umbrella of ESPAS (the European Strategy and Policy Analysis System).

### Start one project as a stand-alone test in one field. Experiment with short processes on demand in a given field of search. Include History Scanning as an experiment – look at H2020 and FP 7.

Despite the considerable experience, Horizon Scanning is still a field of experimentation and method development. Through this experimentation – also with new technical

[1] The European Centre for Political Strategy

developments – Horizon Scanning becomes more useful. A major recommendation is: 'just do it'. Try Horizon Scanning in a first project, and additionally experiment with other short processes on demand in a given field of search. Train the knowledge, learn by doing. This means that there must be test beds and 'free zones', in which the interesting results are used – but mistakes are allowed and serve as learning experiences. This will also spread the tacit knowledge of 'how to do it' to other people and units in the European institutions and the real users. Such an approach will create more demand for Horizon Scanning, too, and a better understanding of the possibilities.

Continuous Horizon Scanning and stand-alone projects are useful in different ways: Continuous Horizon Scanning processes provide individual users with information that might be of interest to them. More and more automation (searches, storage, permanent monitoring, first filtering, then extracting information) is possible and tested. If the user is able to define what is of interest to her- or himself, this kind of scanning should meet the requirements, although the generated results often generate information overflow. Stand-alone projects are often useful in addition to continuous processes to gain a new overview, maybe from a different perspective, or to start more focussed searches and scans in a limited field of interest. History Scanning – e.g. looking at the projects of H2020 and FP 7 (or even earlier) can help to learn about past horizons and maybe uncover findings that can be 'revived' and re-exploited. Sometimes these findings were too early at their time and now, with a different view, they have a different meaning and are useful again. Learning from earlier experiences is another effect (including learning from the former methods applied).

## Select the tools, sources, ways of sense-making and visualisation form. The implementation of Horizon Scanning results and the transfer into actionable knowledge has to be thought through from the beginning

The diffusion of pure Strategic Intelligence results (data, figure, facts only) or just machine-generated results is rather difficult to interpret and often remains unused. Both the purpose of the HS activity and how the data will be used should be made clear from the beginning.

Automated Horizon Scanning is possible and the tools are improving, but it has limitations. People can be assisted by search machines and their algorithms but they cannot be fully replaced when it comes to assessments, decisions and the transfer into real action. Human beings are still necessary to coordinate the processes ('scanners') and to assess the topics according to different dimensions, to coordinate different fields, take into account the knowledge of different disciplines, and to deepen the analysis. There is also the issue of cross fertilisation: the more distant and remote some theme areas are, the more difficult it is to see how they are related, the more you need humans. The definition of 'expert' for those who are involved can be rather broad – human beings are needed to focus, validate, make sense and bring in different perspectives. For issues that cannot be described with a single keyword or short phrase automation is no option. To **translate the information into real action** and implement it humans are still the key – they are the actors.

Therefore, a **tool for automated, semi-automated or qualitative scanning** and searching can be helpful but needs to be simple and it should be used and experimented with.

For the sense-making and the strategic view, assessment criteria and the implications are important. Therefore, **different stakeholders** in the own organisation or – if it is needed to have a kind of 'neutral' or 'open' view – even external actors are also necessary for sense-making. They open the box in order 'to think outside the box' and broaden the perspective. External persons can be 'experts' in the classical sense (academics) or those who are affected, e.g. housewives, citizens just picked from the street, handicapped people, extreme sports amateurs, policy-makers or others who might know.

## Potential users of Horizon Scanning in the European Institutions need to know what is possible and how it could be integrated into search and sense-making.

A certain broad overview over and understanding of Horizon Scanning methods in the European Commission and institutions is necessary to enable the organization to make full use of the toolbox for Horizon Scanning. The capability to understand how methods can be combined or are complementary is essential. To really understand what kind of results a method produces and to interpret the results is necessary for practitioners – decision-makers and users need to understand what the data or information mean and which context they are derived from.

One important element that needs to be understood by every user is that extrapolated or estimated data and results from Horizon Scanning may be the best information available about future issues. They are generated with rigour and thoroughly discussed - but they are neither self-evident nor universally true.

The best way of understanding European users' demand is to integrate the responsible people into the definition of the scan field, the searches and the sense-making. They are not supposed to give advice to themselves but to guide the search and clarify what is really needed. Then, the users also understand the limits of Horizon Scanning (both: limits of the methods and limit of the horizon that is scanned). Bottom-up work helps to bring in this demand articulation.

Demand for Horizon Scanning can be stimulated – by talking to the persons who might have a demand, by informing the institutions and by just experimenting.

Simple language related to the issue has to be used, not jargon. A translation of the different expressions might be necessary. The results have to be present at the right point in time and given to the right place and user in this specific time frame (e.g. according to the policy cycle and the European calendar).

# STUDY

## Introduction and Definition of Horizon Scanning (HS)

Forward-looking activities aim to better anticipate future opportunities or threats, and to identify issues that are of major importance for the future and the present. Debates about future issues help to understand what is relevant and what can be ignored. Horizon Scanning has an important role in forward-looking activities: it serves to explore futures, 'emerging issues' and signals of all kinds, and to evaluate the importance of 'things to come'.

During the last few years, different 'Models of Horizon Scanning' have been developed; method-combinations have been tested and implemented. Specific 'Horizon Scanning' institutions have been set up in some countries. Horizon Scanning (HS) approaches mainly serve to enhance resilient policy-making, address policy makers' needs and concerns regarding new issues, to identify business opportunities by anticipating consumer and societal needs or to prepare society for less expected or rapid changes.

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Horizon Scanning is a large part of the Strategic Intelligence phase of the strategy process described in EFFLA (EFFLA a,b,c,d 2013 and 2014 see Figure 1). Although it mainly refers to information gathering it is strongly linked to Sense-making (phase II, see Figure 1). Time frames (the 'horizons') may differ according to the subject and purpose of the approach.

Horizon Scanning is often based on desk research, helping to develop the big picture behind the issues to be examined. It can also be undertaken by small groups of experts who are at the forefront of the area of concern, share their perspectives and knowledge with each other so as to 'scan' how new phenomena might influence the future. A solid 'scan of the horizon' can provide the background to develop strategies for anticipating future developments and thereby 'gain' lead time. It can also be a way to identify and pre-assess assumptions about the future to feed into a scenario development process.

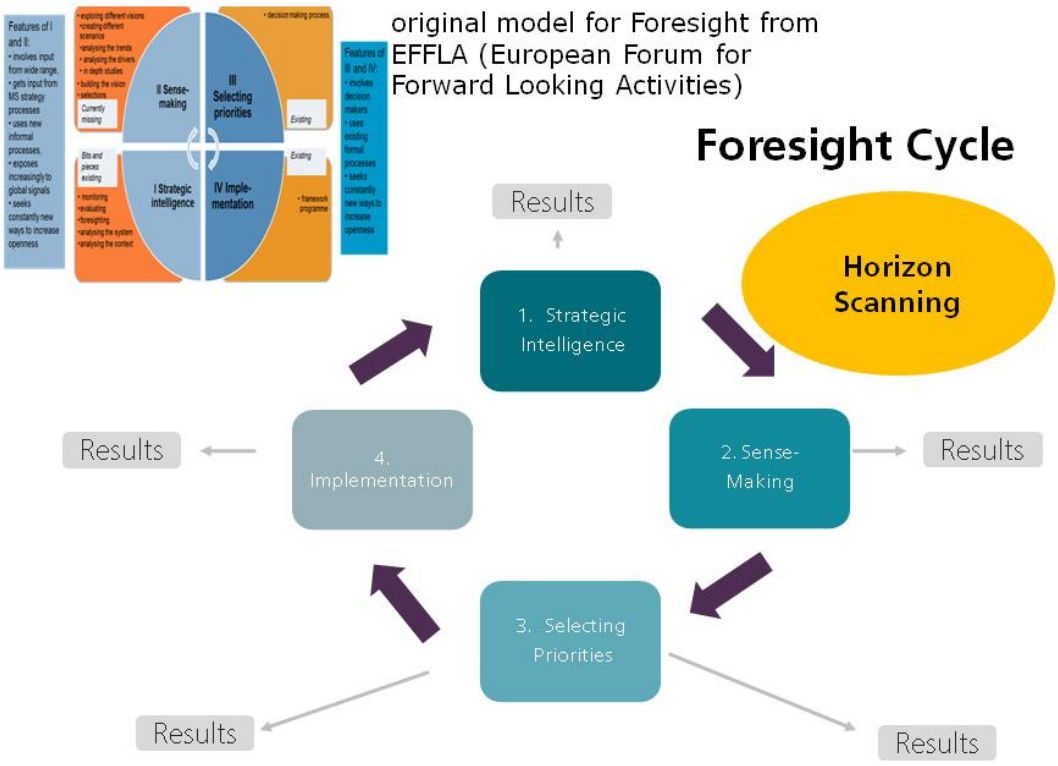



Figure 1: Horizon Scanning in the Foresight Cycle (according to EFFLAa 2013 and EFFLAd 2014)

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This study's recommendations are based on what was reported as working well and on pitfalls that have been identified in different organizational contexts. The case studies were chosen because they are regarded as 'successful' and thus the study has a bias towards 'positive' experiences.

The study addressed the following questions:

- Which types of expertise and skills are used in Horizon Scanning (HS)?
- How is HS organised in relation to the policy-makers who may use its results (in-house versus external, central vs. decentralised; horizontal vs. thematic; institutionalised vs. specific to the project)?
- What is the scope of HS activities (in time as well as thematic content/ policy sector)?
- Which type of information is scanned? What are the sources (e.g. in the organisation itself/ in other organisations/ (scientific) literature/ media/ interviews (with whom?)/ the internet/ other)?
- How is the approach of scanning carried out? What are the methods and tools that are used? How do they make use of human involvement and participation? Do they use expertise and/ or lay input and how? What emphasis is placed on evidence-based and on creative activities?
- How are the data filtered, analysed and how is the sense-making performed? Is there a link to sense-making or is the Horizon Scanning embedded into the process?
- How are the results presented and communicated? Are there specific categories of 'clients' for the different HS elements? Is this done with the help of editorial

committees? If yes, how are they composed and are there different committees for distinct target groups?
- What are the necessary resources?
- How is HS integrated into the overall foresight process and into the strategic planning process?

Answers to these questions come from a set of case studies of public organisations and companies, which were analyzed to learn about 'good practices'. The additional material used is from internet and published reports as well as insights from interviews with key actors carried out in spring and summer 2015. The findings and recommendations are presented here with a view to help the discussion of lessons for the European Commission, during a workshop in Brussels in autumn 2015.

## Cases

The cases were chosen according to the preliminary definition of Horizon Scanning, the accessibility of sources (reports, internal documents, internet pages, other material), the classification of being 'successful' in relation to their purpose, and the availability of experts who could be interviewed as 'insiders'. In some cases, interviews could not be conducted because of time restrictions or unavailability of interview partners – but the material was included. 26 interviews were performed. Table 1 in the Annex gives an overview of the cases.

Qualitative interviews were performed with the questions raised in the template (see Annex 3) to 'fill the gaps' in the templates and integrate experiences, insider knowledge and 'lessons learned' from the respective cases. Thus, the cases are qualitative learning examples for different models of Horizon Scanning. They are neither exhaustive in themselves nor do they cover the totality of HS activities in the world.

However, a broad range of experiences was covered: From completely automated Horizon Scanning processes to open searches via scouts (people), from national large-scale foresight processes mainly based on Horizon Scanning for an overview of a variety of 'things to come' up to small company-specific and target-oriented searches. There were resource-intensive processes as well as very small-scale and resource-saving approaches, some with the intention of participation and involving stakeholders, others with expert participation and focussing on single and very detailed issues or just automatically generated reports (dossiers). The time horizons of the approaches and the content varied a lot.

The Horizon Scanning results of the specified cases are communicated in reports, dossiers, newsletters (regular or irregular), internet platforms, people only or a combination of different possibilities.

The next section describes the analytical findings from the cases. The different cases were 'compared' by looking at the elements and categories asked for in the interviews and written down in templates. These were the results answering the questions raised above. The following sections display those results before deriving policy recommendations.

## The Analysis of Models of Horizon Scanning

## Objectives

The most important aspect of any model of Horizon Scanning is the *definition* of the objectives. The reason for the Horizon Scanning and the policy context, in which it is performed, determines the best approach and the outcomes that are expected. Our analysis starts therefore with a discussion of objectives associated with Horizon Scanning. From the limited number of cases we cannot conclude direct relationships between objectives, methods and performance of processes – this needs to be systematically clarified in a different study.

In general, Horizon Scanning was performed for the following reasons:

- To provide a forum for monitoring, reviewing, and sharing information about future developments of any kind,
- To give orientation, identify chances (e.g. for future emerging technologies), serve as an early warning system (e.g. emerging conflicts), and initiate dialogs.
- To generate background information, evidence and scenarios for foresight projects. Horizon scanning forms an integral part of what is called *trend analysis*, and is typically implemented as one part of setting-the-scene or contextualizing activities within foresight projects.

Specific objectives of different Horizon Scanning cases were defined by the direction of the search (e.g. key areas that are scanned, keywords searched for) or even by the research or technology field they are supposed to serve. Some cases have Horizon Scanning integrated into a full foresight process from the search of topics to priority-setting and recommendations (see figure 1). Others are more focused on details. For example we find

- early warning: e.g. to warn practitioners that the 'preferences' of patients are changing; strategic early detection
- informing policy-making; contributing to open policy making; assisting the government in determining the main directions for the future of the nation and the medium and long term objectives for its economic, social, cultural and environmental development. Contribution to the preparation of governmental reforms, navigation
- identifying new research and technology focuses, innovation fields, e.g. new technologies, which potentially have major implications for the health system, including prioritization
- identifying upcoming 'Hot topics'/ to find out rapidly-developing research areas, hot research areas
- assessing areas of technological change
- identifying under-used technologies
- systematically investigating evidence about future trends
- analysing potential fields of technology and innovation, in which strategic partnerships might be possible
- gaining control over what is coming into the health system, delivering the appropriate technology and the right care; assisting in the control of technologies in the health system
- identifying broader health problems
- anticipating future needs for long-term planning
- reacting on demand of policy-makers
- identifying the global challenges, influences on the country, risks and opportunities, general markets (not only hightech) and which S&T should be tackled in the future
- 'We anticipate emerging policy challenges and opportunities in a rapidly changing and complex world. Through scanning and foresight we monitor and explore social, economic, environmental, and technological changes in … and around the world. We then look at how these changes may come together in the future.'
- helping federal organizations to take a holistic, longer-term approach while they are dealing with their short-term priorities
- informing the US Congress on single topics with future relevance
- preparing a strategic plan for serving the US Congress (e.g. one for fiscal years 2014-2019)
- creating an analytic understanding how global life style changes are likely to impact the company business in the future, and to support the R&D and innovation strategy to address those implications
- the first step in analyzing the broader landscape in foresight processes and creating the context, e.g. in the Lasnamäki City Neighborhood Future horizon scanning was used to create different economic scenarios to understand the future of people living there in the future; or: the objective of horizon scanning activities at APA is seen as to create background information, evidence and scenarios for foresight and strategic planning projects.
- interconnecting knowledge on issues and developments potentially shaking or shaping the future of science, technology and innovation (STI) in Europe and the world

- making use of the knowledge of European scientists, especially those from the entire JRC, to identify weak signals and emerging issues
- exploring possible future opportunities and threats for the Dutch living environment and welfare
- defining an innovation roadmap for kitchen appliances. Based on this roadmap more concrete innovation projects can be defined.
- training the clients in foresight so that they are able to help themselves, helping to raise horizon scanning capacity across Government
- providing automatically generated information about future issues in a well formatted and easy-to-use way
- coordinating work between departments and input from experts outside the civil service, through creating 'communities of interest' around specific topics;
- improving cross-government horizon scanning work by using a wide range of expertise to obtain new insights and challenge current thinking;
- developing networks to gather and share information and to gain new insights;
- bringing emerging issues to a senior level audience, as well as commissioning work on areas of interest

In some cases we found broad objectives that could require full foresight exercises (e.g. France Stratégie):

1. *Evaluate public policies independently and exemplary*
2. *Anticipate developments of the society*
3. *Open debate with social partners, civil society, enterprises, specialists and academia*
4. *Suggest policies/reforms/orientation to the government*
5. *How to promote emerging fields as fast as possible?*

In other cases Horizon Scanning was directly linked to Science, Technology and Innovation policy goals, e.g.

- The STT Horizon Scan 2050 has four aims: Inspiration. Vision. Risk analysis. Innovation. (from STT Horizon Scan 2050, Netherlands)
- Create anticipatory intelligence to enhance future orientation of the STI system (from NOSEit, Romania, similar: National Intelligence Council, USA)

Others are very general:

- Monitoring of critical issues
- Reporting of emerging issues
- Conducting benchmarking activities
- Analysis of opportunities and risks for new activities/industries and/or regions
- Technology monitoring and foresight
- Foster creativity and capitalize on new ideas
- Accelerate organizational learning and agility
- Foster networking (national and international)

(see DPP Horizon Scanning, Portugal, some similar elements can be found in Future Watch, Finland, or UK Horizon Scanning since 2014)

## How is the scanning carried out? (procedures and methods)

Horizon scanning is often understood **broadly** as an element in foresight projects and activities (see objectives), and not implemented systemically as an independent activity. But there are also cases, in which Horizon Scanning is a single and **stand-alone activity,** e.g. for monitoring specific thematic fields, deepening the content and contributing information to future questions or when reacting on a demand. To work out the 'real' question in a specific field and to dig deeper is often the real challenge. Sometimes, only the obvious topic fields are looked at (in technology scanning always the same candidates like biotechnology, nanotechnology etc.) – but it is much more difficult to find out what the challenging areas are, what the problems in further developments are etc.

It is also different if the aim is to look for an **overview** of things to come (open search or search over a lot of fields like in the OECD, the BMBF Foresight, Germany, RAHS

Singapore, and others) or if the **search field is already limited** (e.g. search in a technology field, an area like the UK Foresight, or for a very limited application, e.g. kitchen equipment for Philips). In most cases, meta-studies are performed, e.g. in the EEA with an assessment of existing information, stakeholder consultation, a public call for evidence, literature review, expert workshops, and wide stakeholders consultations.

**Methods applied** range from automated searches via keywords and their modifications to open (explorative) scenario workshops.

In automated searches one major task is the **definition of keywords**.[2] Often, the keywords are defined in a group (steering group, expert group, user group) or by those who perform the scanning. In these cases, the sources have to be defined. They may range from single databases to the full internet. Results are documents (dossiers) which are handed over.

'Methods'[3] found were:

- Desk research: identifying and reading relevant literature, qualitative methods
- Automated and semi-automated literature search (different sources from complete internet to specific databases)
- Bibliometrics
- Patent searches, searches in scientific journals and social networks are more and more performed with software toolkits
- Text mining and other automated searches in different sources
- Science Maps
- Conference scanning
- 'Environmental scanning'
- Expert opinions (single, interviews, surveys…)
- Scenarios
- Storytelling
- Matrices etc for structuring
- Platforms for exchange of information
- Social Media scans…

Horizon scanning activities are rarely performed on the basis of only one method. Usually a number of steps using different methods and technique are performed sequentially or in parallel. The majority of the projects includes structured steps that build on each other.

[2] Although there is a discussion about pattern recognition in big data volumes for Horizon Scanning, there was no case really applying it.

[3] Some are strict methods, others are strictly speaking 'concepts' or 'procedures'.

**Steps of Horizon Scanning:**

Assumptions
- Interviews and reading to frame and understand the problem
- Track core assumptions to test

Scanning
- Identify insights/weak signals that change is occurring
- Assess relevant trends
- Elaboration of commonly-held assumptions

System mapping
- Identify key elements in the system
- Describe key relationships

Change drivers
- Describe change drivers shaping the system
- Influence maps of second and third order consequences
- Preliminary examination of the interaction of drivers

Scenarios[4]
- Scenarios to explore a range of futures
- Identify potential challenges and discontinuities
- Testing for robust assumptions and strategies

Products
- Credible assumptions and key uncertainties
- Policy challenges
- Emerging issues

Horizon Scanning performers, the 'scanners', can be:

- **Professional scanners** who use methodological know-how but are not necessarily experts in a topic field
- **Machines/ Robots/ Algorithms:** IT specialists programme automated scans, and secure storage in a system but do not necessarily have content knowledge
- **Expert scanners** who perform the scanning in their field of knowledge – they often work qualitatively or combine methods
- **Volunteers** who contribute whenever they find something interesting that is related to the questions, when their personal field of interest is touched upon or in Social Media. They often do not know the full context of their contribution but just answer single questions. Some even do not know that their knowledge contributes to Horizon Scanning (e.g. when Twitter accounts were scanned professionally/ automated).

[4] Scenarios (esp. exlorative ones) are also regarded as tools for opening up new and different horizons, identifying different futures that can be lying ahead, therefore, they are not only applied in full foresight processes. The borders are blurring here.

The following examples are about Horizon Scanning with different method combinations. In the centre are professional scanners managing the process – some also integrate volunteers.

In the BMBF Foresight Cycle I for example, **combinations of different approaches** and sources were found in the Horizon Scanning part. This is a rather broad example of trying to achieve a science and technology overview. The methods and approaches were:

- Structured, focused interaction with experts (workshops and interviews)
- An analysis of the innovation system, including a review of current strategic processes in the institution
- Environmental scanning (literature research, conference analysis, scanning of relevant results)
- Secondary analysis of current international foresight studies on research and technology
- Analysis of the dynamics in scientific publications (bibliometrics)
- A broad online survey of experts to provide a differentiated evaluation of relevance and the need for action
- Two-stage personal survey of top international experts (Monitoring Panel)
- Inventor-scouting (targeted surveying of young researchers)

In this case, the results were continuously adjusted and written down in a standard structured format (with standard titles and description text).

A follow-up approach (example: BMBF Foresight Cycle II) was based on this procedure but combined the search for science and technology topics with those of societal trends (described in 'profiles') by formulating 'Stories from the Future' and 'Innovation Seeds'.

In the European iKnow project, there was a sequence of Formulation – Realization – Evaluation: The inward-looking top-down (ILTD) strategy required the mapping of WIWE via **literature reviews**, **workshops** and the **scanning** of over 3,000 European Commission funded **research projects** conducted by dedicated teams from the iKnow Consortium. The outward-looking top-down (OLTD) strategy involved the systematic mapping of WIWE inspired by a wide range of knowledge sources outside the European research space, e.g. websites, blogs, journal articles, official reports, science fiction books, etc. The inward-looking bottom-up (ILBU) strategy involved the mapping of EC funded research activities by iKnow Community members representing government, business, research/education, international organisations, NGOs and other STI actors in Europe and the outward-looking bottom-up (OLBU) strategy promoted the mapping of knowledge sources outside the European research space. It relied on scanned activities carried out by worldwide iKnow Community members, on voluntary basis. The problem mentioned here was that the same topics re-appeared several times because the voluntary scouts did not know that something was already sorted out. It was also difficult to keep the volunteers motivated.

One of the lessons from the examples mentioned is that volunteers can be activated to participate in Horizon Scanning, but their involvement brings all kinds of challenges: They need the right motivation to work over a long time; they can lose interest or just forget to participate; using their knowledge is difficult; managing volunteers makes control of the process and its timing difficult, and managing expectations can become a challenge.

**Cases Japan**

In Japan, several approaches are employed in a continuous foresight: **Delphi surveys**, which are a two round assessment of topics and statements. The fields are decided by a Steering Committee with the help of a **Future Technology Conceptual Map**. Expert committees formulate the Delphi statements. For the first time the 10th Delphi is run on an internet platform. The data are analyzed and used as validated information for the next basic plan and inform the highest Science and Technology Advisory Council (CSTI).

Another approach are **Science Maps**. For the maps, professionals use algorithms to select the Top1% papers from the official databases. The papers are grouped, experts read and analyze them. When they have an overview, they name the research areas, and search for Japanese authors in these areas. Only a few maps are derived from this. In the first years it was attempted to read all identified papers but as too many research areas were detected (600 and more), a threshold of 100 papers which were to be analyzed was set. In addition **text mining** was applied to decrease the burden for the experts to read all papers. In the latest approach (since 2012), the research areas that have been found have been analyzed by text mining, not by experts anymore. No experts were needed to read, but to help with developing keywords for the report. Sci-GEO chart (the chart represents geographical characteristics of research areas on a Science Map) was added to categorize the research areas using continuity (time axis) and the strength of relationships with other research areas (cognitive axis). 'Hot areas' and 'hot topics' could be categorized like this and changes over time could be observed. In Russia a similar approach is found. An expert data base is built up to identify ALL available experts who could participate in such assessments.

In parallel, **scenarios** are worked out in a Committee on scenario analysis, and a **survey** in 'society' was performed last in addition to the 'Future Society Vision Review Workshop 2013'.

There are Horizon Scanning cases which start with '**challenges**' and derive questions from them or identify solutions. These approaches are often qualitative. For example STT Horizon Scan 2050 in the Netherlands started with a literature review on the distant future in order to identify Grand Challenges and Signals for Change, using key words such as 'breakthroughs', 'signals', 'seeds' (for/of change), 'significant developments'. It prioritized Grand Challenges and Signals for Change through a plenary debate with members of the Steering Committee and an online questionnaire. In the end, six Grand Challenges were identified as being the most relevant, in this case for the Netherlands. **Signals** were **prioritised** through an online questionnaire. Experts were asked to rank a long-list of about 150 signals according to possibility, impact, and the desirability of the signal actually occurring. In the end, 57 SfCs were selected on the basis of this ranking followed by an in-depth discussion of challenges and signals in six dedicated workshops, additional workshops exclusively dedicated to the Unknown Unknowns for 2050 or to the technological SfC, workshop with ethicists, philosophers and artists (painters, visual artists, theatre directors, etc.) and six professional storytellers who wrote eighteen (narrative) stories describing the potential futures of the GCs based on the outcome/data of the **workshops**.

The opposite way (bottom-up scanning) is **exploratory scanning** as in figure 3 (SESTI project, Butter et al. 2010 and 2011).

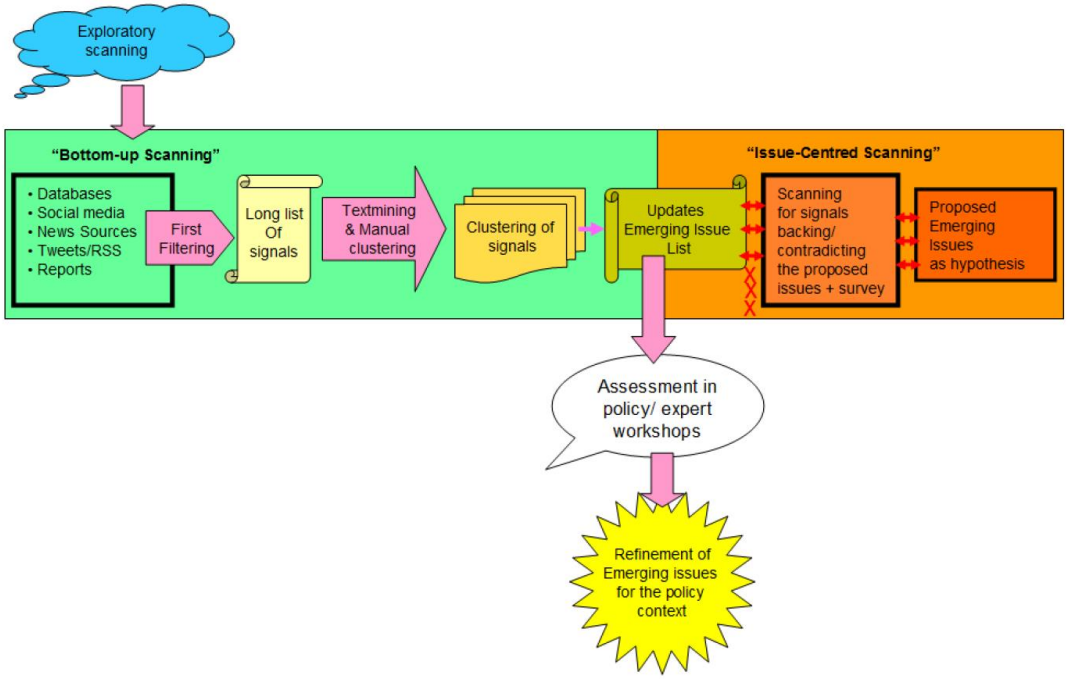



Figure 3: Exploratory Scanning (source: SESTI, Butter et al. 2010 and 2011)

At a company we found smaller scale scanning (only experts) involving:

1) **Trend research** to take stock of potentially important trends
2) **Internal workshops** with internal company experts to elaborate trends
3) **External workshops** with experts and lead users (e.g. writers of food magazines, cooks etc.) to validate the identified trends

In Romania, efforts were made by a research institution to maintain a '**trend wiki'**. The trend wiki needs to be regularly updated, provides information on major trends that are likely to affect the organizations' future business opportunities (in companies or research institutions). A critical mass of input is necessary. A critical point in maintaining a wiki is to motivate long lasting, continuous participation, be it in an open wiki, inside an organization or even in a small-scale company solution. People just forget to contribute and reminders are often ignored. No case was found where the problem of how to keep people motivated was successfully resolved.

Pure scanning can be performed **automatically by software.**

A professional provider of Horizon Scanning (Shaping Tomorrow) uses software that searches and reads out 1. specified organizations, 2. people (futurists, bloggers etc.), 3. keywords and semantic search. The searches can be semantic and multi-lingual. The software exports lists of information and ready-made presentations. Statements and indicators add to the list. The company also performs surveys and conducts workshops with clients. The toolbox is available so that in selected areas additional primary data can be generated automatically. The approach is based on secondary sources which exist on the web. Instant scenarios are possible.

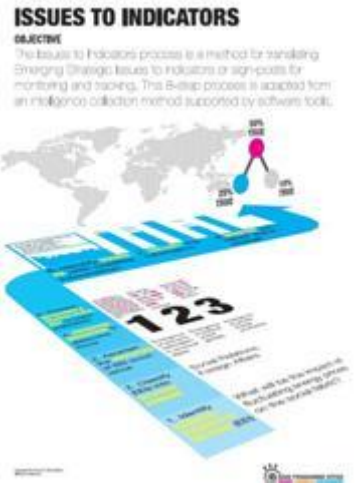
But in most cases, again, humans are needed. A good example of use of a software platform is in Romania, in the Human Evaluation of News.

***Human Evaluation of News*:** The scanning process is organized on a gaming **platform** (TAGy). Through the game 17,000 current news items are evaluated monthly by a group of 17 master's students with diverse disciplinary backgrounds who 'play' TAGy in rotating pairs of extractors and assessors. Out of the evaluated news items 2% are generically validated as weak signals, based on which 30 per month are selected as top weak signals. The group of evaluators does not work on the basis of a definition of weak signals, but on making use of the tacit knowledge people have, which is permanently monitored by the organizers as convergence in the game. The way signals are selected (selection behavior) is continuously monitored to assess if there is convergence and to check if there is an influence of different attitudes, e.g. stubbornness. The findings are stored in a structured repository. Filtering is possible according to several categories (source, data, 7 WS categories).

Machine supported structuring is applied using a combination of Natural Language Processing tools, the team can now cluster the whole repository, classify the news by domains and sub-domains, check the similarity of news and spot the primary sources. More features such as semantic estimation of novelty are under way.

The most sophisticated automation system is supposed to be applied in Singapore. The RAHS Solutions Centre has developed a range of processes to aid analysis (figure 4).





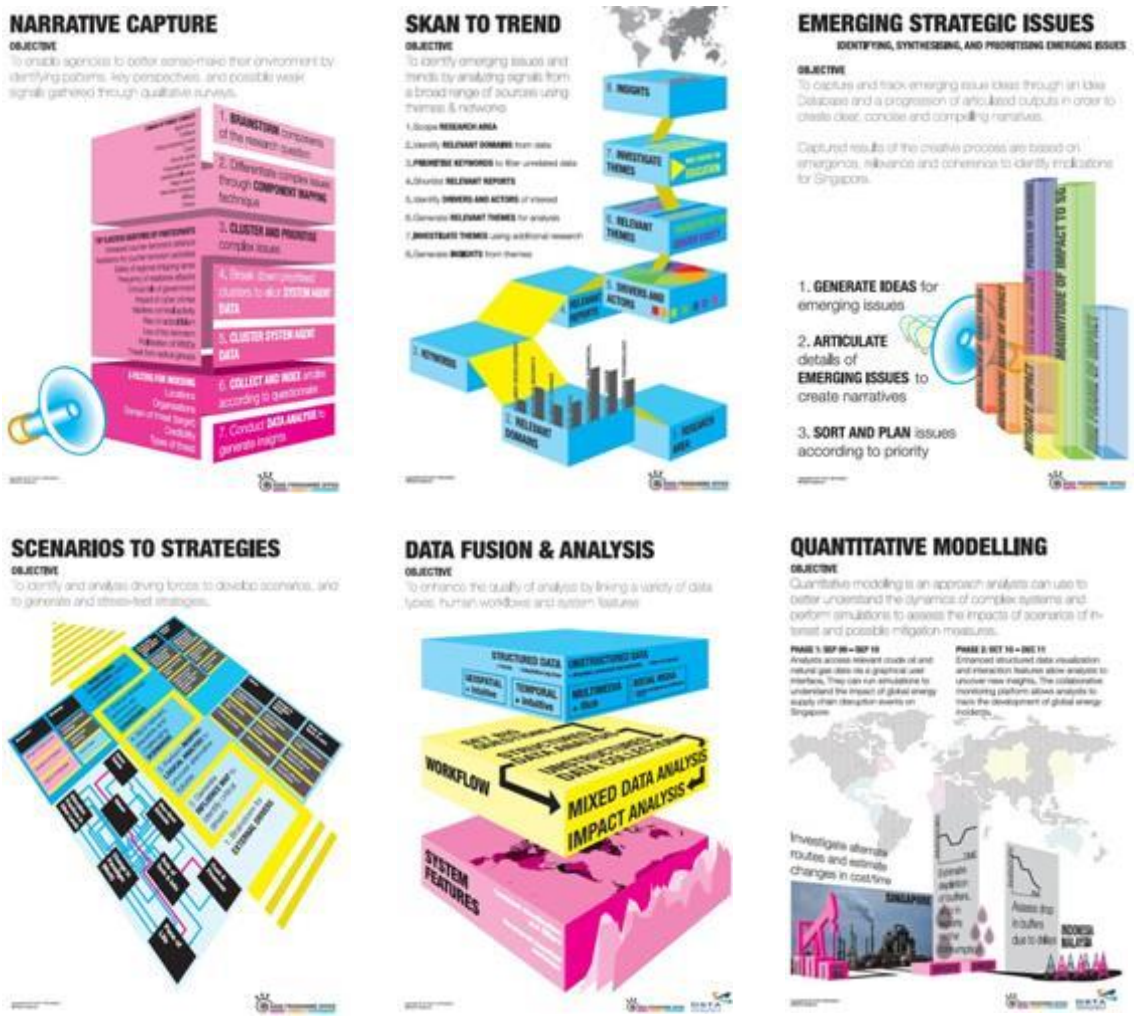




Figure 4: Components of the RAHS Singapore system (www.rahs.gov.sg)

The steps are the following:

- Environmental Scanning
- Issues to Indicators
- Sentiment Analysis
- Narrative Capture (patterns and perspectives)
- Scan to Trend
- Emerging Strategic Issues
- Scenarios to Strategies
- Data Fusion and Analysis
- Quantitative Modelling

Form the UK, where Horizon Scanning was performed with interviews, bilateral dialogues and other methods, we got a warning: There is the danger that the **database** that is generated in the end is regarded as the major outcome and seen by users as the whole Horizon Scanning activities. The *Sigma Scan* (UK Horizon Scanning) was a database created for storage that was open to anyone who wanted to use it (open to public). The whole Horizon Scanning activity that was performed in the UK at that time was much broader and included interviews, bilateral talks with users, and other sources and methods. In fact, Sigma Scan was just the 'representation' of the activity to the outer world, and an archive. *Delta Scan,* another tool was also available as the more S&T focused version of a data base. It ended up that the public as well as users regarded Sigma Scan as 'the Horizon Scanning'.

**To sum up**, all approaches consist of three main types of activities that are organized hierarchically: ***Signal collection***, ***Sense-making***, and ***Specific reports*** (summary from the Finland Future Watch). Filtering takes place throughout the whole process: the pure search and collection (What to search for?), in the sense-making (How is it related to the

objectives or the organization? What is useful in the specific case?) and in focusing on specific reports.

We did not find any specific methods for specific issue sets, e.g methods that are only used for societal topics or for technical fields. We could observe that the more societal and 'soft' topics are more often dealt with qualitatively (see below: thematic focus) because they need longer explanations and the 'sense' of the topic is described in a sentence, not in a keyword that can be searched. For pure technical searches with clear keyword definitions, automated searches are found more often. But only a very general procedure can be derived from the cases. This procedure is as follows:

1. Define Scan field
2. Characterize Scan field
3. Select sources and methods
4. Search Scan theme
5. Search context
6. Expert dialogue
7. Preparation of Scan report
8. Use of Scan report

## How is it organized?

It is clear that the organization of HS activities depends on the objectives and the organizational context in which the activity takes place.

***Top-down or bottom up information flow?***

Foresight and also Horizon Scanning activities often include both top down and bottom-up elements (SFRI paper Working Group 5, 2015). In Horizon Scanning, the question is often how far laypersons can be involved. Wikis are often fed with opinions from experts on a lower hierarchical level in the organization. On the other hand, there is often the request from the top management to find signals or explain an upcoming issue. Both can initiate Horizon Scanning projects, both are important to maintain the activity. Looking at the HS cases we studied we found **more top-down organization** (clear hierarchies) **for overviews** (e.g. if the management needed an overview about things to come for strategic reasons and positioning in the landscape).

When specific topics were chosen for further detailed analysis, the activities were often **more bottom-up,** based on the opinions of external experts who were consulted, volunteers who contributed, and lower level management. We found top-down organization if the topic or search field was clarified and limited in advance ('Please find information about technology xy'). In these cases, the procedure and organization of the HS group and the 'scanners' (e.g. inside the company, involving external persons) were often dependent on the methods and tools.

***How is the output of Horizon Scanning generated?***

There are HS processes with **regular output** (e.g. newsletters), **continuous and irregular outputs** (platforms, wikis etc.) as well as **ad hoc production of output** (if the need is felt, scanning on request). If only information about searches, future issues, weak signals etc. is provided (possible in all output cases), the information is often just summarized in templates, in a newsletter or put on a platform by **single persons** or a **dedicated department** in the organization. When working with newsletters and reports, a mix of older and newer members, age groups, experience, expertise, and world views helps to balance articles in the reports. Regularity is more important than organization in these cases – for regular reporting, often a specific department or single persons are responsible.

There are also **examples without any formal 'organization'**: They just provide a platform or work completely electronically with very limited manpower in the background (e.g. Shaping Tomorrow or RAHS Singapore). The content 'lives' from volunteers' contributions or is generated automatically. In these cases, the scan aims to provide information rather than at creating knowledge, sense-making and assessment of the information. In other cases, the information is just spread via online platforms and all activities work virtually. In these organizations, it is even difficult to identify the 'responsible person' or contact person (e.g. France Stratégie). There is also the possibility of platforms without any coordination or strategy. The platform is provided, participants fill it with content and are able to use it. It is difficult to keep this organization running – but with motivation of the participants and the incentive of joint use of information, it may work. In the half-automated approach of RAHS in Singapore, we find an organization according to the tasks of the HS (see figure 5).

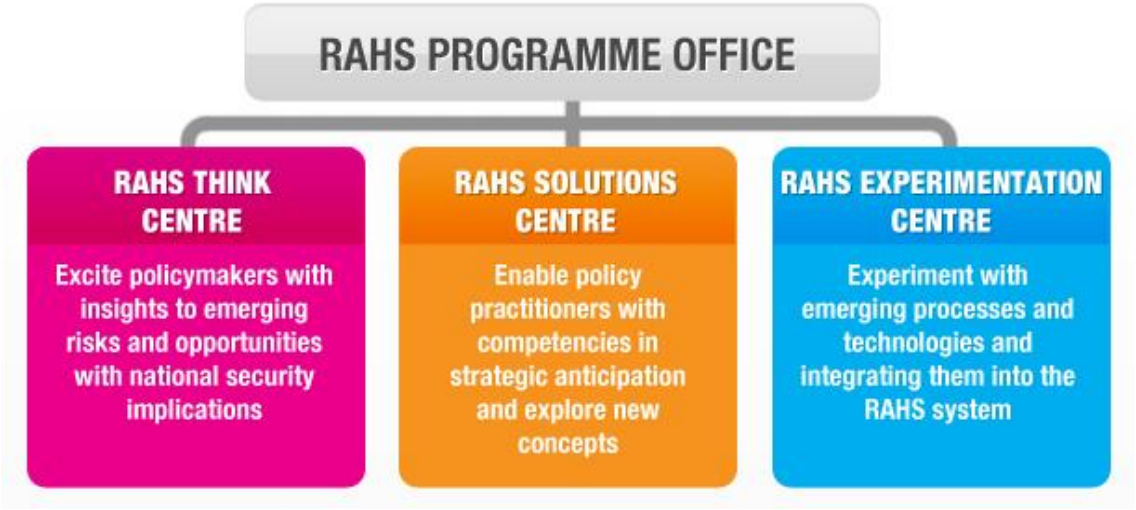



Figure 5: RAHS Program organization

***Centralized, embedded and decentralized organization***

Horizon Scanning often searches for topics (themes) that have to be described in sentences instead of just single keywords or short expressions, and therefore automated searches do not suffice. The procedures need much more coordination than just single automated searches where the keywords are looked for or semantics can be applied. In these cases, we often found **decentralized scouting systems** in the case examples (e.g. scouts or specific experts in different locations or responsible for specific content, topic coordinators in the German BMBF Foresight Cycle I).

In such cases, centralized and decentralized searches are often combined to provide an appropriately detailed search strategy. In the BMBF Foresight Cycle I, for example, topic coordinators (2 or 3) were responsible for each topic field: to work out the topic in general and provide relevant information at the different steps of the process, to perform peer-to-peer interviews. An internal management group was necessary to strongly coordinate the different activities and methods as well as methodological interfaces. They

also prepared the content for the different conferences. In other cases, scouts are just informed and search for topics and content with a list of criteria.

For the European Commission, the JRC also attempted a decentralized scouting approach (case of the past) with 'correspondents': a search for new issues, weak signals and emergent issues among all JRC scientists was performed. For this, in each institute, there was a responsible person ('correspondent') in charge of collecting the information. This was delivered to Brussels, where an editing board selected, discussed and fine-tuned the issues found. The board edited them for a 'Bulletin', a kind of newsletter that was sent to all EC managers – the problem was a kind of information overflow: there were not many real users.

A similar decentralized scanning and reporting bottom-up in the OECD organization takes place (but without dedicated 'correspondents'): The whole OECD regards itself as being a forward-looking institution so that there is an indirect and partly informal scouting system (every employee is doing some kind of scanning or foresight, in the ideal case handing over what is found to those who are interested) in every Directorate.

But also in automated platforms, decentralized input is necessary and has to be provided. In these cases, the input is given by volunteers or experts, stored in the systems and analyzed. Some are by definition committed to the projects, others just join when needed, give their input and are not involved, anymore.

One way of organizing Horizon Scanning activities is with **expert committees** that work out topics. In case of the Japanese Foresight the topics can be based on the previous Foresight and include new developments. In Japan, the institute responsible for the methodology, for performing a Delphi survey and the scenario work (NISTEP) is organizing the meetings, doing the searches and compiling the information. Linked to this, institutionalized processes e.g. by a national institute with a thematically broad and open search is possible (top-down searches commissioned to another institute). Here often, the demand is top-down so the report (required by high ranking persons in the institution) and reporting back is meanwhile institutionalized. This way of organizing a HS process (here combined with a complete Foresight) is very stable over a long time, but it takes time to get all actors involved used to it.

An example for the **embedding** in broad inter-ministry and inter-agency efforts is the Finland Future Watch – with a '*Team Finland'*- to coordinate Finnish policy instruments horizontally in support of business internationalization. Team Finland includes major Finnish technology and business organizations.

**Main members and funders of Team Finland**

- Tekes – Innovation Funding Agency of Finland
- Ministry for Employment and the Economy
- Ministry for Foreign Affairs
- Finpro (Finnish Agency for Internationalization of Business)

Other main members, but without a main financing role, are:

- Finnish Innovation Fund - SITRA
- VTT – Technical Research Centre of Finland
- Technology Industries Federation
- Confederation of Finnish Industries
- Strategic Centers of Excellence (Shoks) in various industries

Within the *Team Finland*, Finland Future Watch is part of a larger global market scanning and analysis program organized within the Team Finland network entitled 'Possibilities of the Markets', and which has three separate segments with differentiated objectives. *Sales Leads* segment seeks to identify possible sales and contract opportunities for Finnish companies in the near term or immediately. *Business opportunities* identifies somewhat broader marketing opportunities within the near term future.




Figure 5: Finland Future Watch as a part of broader Team Finland services

The HS activity is organized to coordinate government activities and capabilities horizontally to serve its intended users, Finnish SMEs, effectively. The program broadly scans signals that can be relevant to its objectives and beneficiaries. When it comes to deeper and more analytic horizon scanning exercises, their thematic focus is flexible and decided by user expectations and program coordinator consideration.

In **companies,** we find HS in strategic divisions or within the R&D division and its management line. They are usually responsible for high level macrotrends and performing overviews, whereas more focussed horizon scanning activities are mainly decentralized. Examples include the large Korean companies, the Chaebol, that have their own in-house systems and are well informed.

**To sum up,** concerning the organization and institutionalization, Horizon Scanning activities are often found as top-down organization (mainly macro issues or performing an overview) when an overview is needed (regularly or at certain points in time). We also find HS on demand (overview or single issues). When single issues are identified and analyzed in more detail, bottom-up attempts of organization and information flow are also common. Horizon Scanning is open to broader participation (see below) when a specific purpose (such as the assessment of topics) or bringing in specific aspects have to be performed. We find centralized, decentralized and embedded structures in the cases.

The form of HS organization is related to whether the activity is 'regular'; 'irregular, but continuous' or 'irregular and ad hoc'. In stable and mainly top-down hierarchical organisations, in which Horizon Scanning is performed, we find the regular activities, in which knowledge has been built up and is used when needed or an infrastructure exists or in regular time frames (e.g. every five years). We also find continuous and often repeated activities in these surroundings but also irregular ad hoc quick searches. Irregular and ad hoc Horizon Scanning is found in all other cases, from self-organised groups performing HS to handing over the HS activities to external organisations (like a research institute) up to performing it without any formal organisation (providing a platform). Transferred to the European Commission, which is a stable organisation, it means that all forms are possible in the EC surrounding.

## Scope and Thematic Focus

The **scope of the time horizon** varies a lot: For some activities the near future of five years is interesting, for others, the very long-term (30 years and more). In most cases, also the view ahead for a longer horizon and the single step backs in time are mentioned (as in backcasting).

On the EC level we found Horizon Scanning activities focussed on Grand Challenges[5] and Signals for Change[6].

The scope of users can be very broad (e.g. in the Romanian case NoseIT the whole Facebook society) or very limited (a single ministry, the US Congress, the Russian President Putin or even single persons who demanded this information).

Performing an overview of 'things-to-come' means taking a broad scope, scanning a huge variety of different issues and single aspects. On the other hand, scan fields, which have already been focused on, diminish the breadth of the searches and descriptions. The **thematic focus** therefore often starts very broadly or with a general overview on things to come. It is narrowed down when it comes to the findings. In the ideal case, the objectives of the project guide the search (e.g. with criteria what and where to search), and define thus generally, which themes are looked at in more detail (detailed scanning).

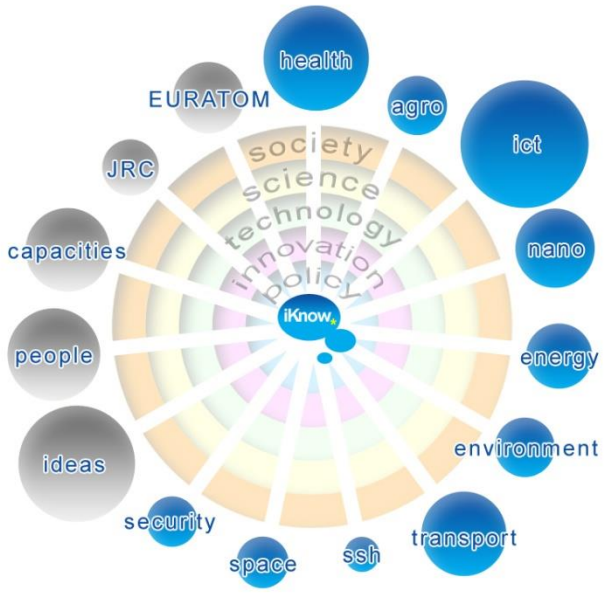



Figure 6: IKnow project (website)[7]

5 **Grand Challenges** are challenges 'of sufficient scale and scope to capture the public and political imagination, create widespread interest among scientific and business communities and NGOs and inspire younger people. They must be capable of acting as an important tool for percolating attention at all levels of society all the way down to civil society and the public at large.' — European Commission, 2012

6 **Signal for Change**: A high-impact event leading to a disruption of or change in a trend, influencing Grand Challenges. A Signal for Change may be expected or unexpected, e.g. the emergence of new technologies in sustainable energy.' — European Foresight Platform, 2011

7 The outer ring of this image shows the 15 specific programmes of the EC FP7 with the size representing the allocated funding, e.g. €9,110 million for ICT research and €610 million for social sciences and humanities (SSH) research

In the cases examined, Grand Challenges are mentioned quite often (e.g. Scarcity, Climate change, Demographic change, Longer life, Global power shifts, New connectivity), but the majority of topics and fields were closely related to science and technology. One example which illustrates this is IKnow (figure 6).

We came across overviews that started broadly with areas like the economy, energy, geo-strategic and social issues (start similar to a STEEPV or PEST[8]), predefined fields of the High-tech Strategy in Germany as a starting point (BMBF Foresight Cycle I), previous Delphi surveys (Foresight Japan), or the broader strategies of the government or other institutions. For companies, the focus was often more narrow (e.g. example kitchen equipment). Here are some examples[9]:

Geographic Focus:

- The Future of Asia
- Estonia Transport and Logistics Future.
- Integration Between Tallinn-Helsinki
- Lasnamäki City Planning Future
- Europe as a driving force
- Thriving Sub-Saharan Africa (2015)
- Kenya – The Promise of New East (2015)
- Advanced Manufacturing Germany / UK, USA, Russia (2014)
- Internet of Things, Industrial Internet and 5G in China (2014)
- China's Future Signals: Health Improving Intelligence & Technology (2014)
- Air Quality and Urban Health in Delhi (2013)
- China's Innovations are Going Global – New Emerging Business Models (2015)
- Quantifying Self
- Act locally – collaborate globally
- Data-intensive governance
- Collaborative economy
- Privacy in change
- Science 2.0 for a plural knowledge society
- civil security

Broad Sector Focus:

- Emerging Technologies
- The Next Economy
- Driving Policy on a Shifting Terrain
- A confident democracy
- Effective Republican equality
- An entrepreneurial and efficient state
- Responsible development
- Education for all
- Space, ocean, earth and science infrastructure
- Social infrastructures
- Urbanization/ Changes in Urban Spaces
- Creative Green
- Human Brand
- Gender, women
- Ocean economy

8 STEEPV is the abbreviation of Social, Technological, Economic, Environmental/Ecological, Political and Value-based issues and is used as a 'method' to structure or classify issues, topics or fields. PEST or longer even PESTLE (Political, Economic, Sociological, Technological, Legal, Environmental) is used in a similar way to structure issues for decision-making purposes.

9 The clusters are only qualitatively chosen to give a kind of overview and on the other hand demonstrate the variety.

Issues:

- MetaScan 2011: Exploring four global forces shaping our future
- Building Resilience in the Transition to a Digital Economy and a Networked Society
- Well-Being
- Environment and Competitiveness
- An inclusive and open society
- An agile economy
- A legible and inclusive social model
- Do-it-yourself
- Governance and leadership
- Global mobility and migration
- Future financial tools, structures and institutions
- Changing labour markets
- Disease and pandemics
- Inequality and social cohesion
- New forms of citizenship and democracy
- Ecosystem resilience

Single Fields:

- Social Media
- Technology fields like Materials, ICT, Nanotechnology, Biotechnology, Photonics
- Production and –processes
- Health
- Water
- Environment
- Systems Research
- Energy
- Neuroscience
- Services Science
- Mobility
- Colleague computer
- Education
- Cognitive Enhancement

## Participation

Participation of external people in Horizon Scanning activities varies a lot but in most cases is limited; much more limited than in Foresight processes. In some cases, journalists are involved to maintain a link to external communication.

Broader participation was found when Social Media, wikis and other such platforms were used for Horizon Scanning. Participants in Horizon Scanning activities were often experts on searches and experts in the different fields, in some cases the project team only. But also networks of experts were used for scouting or bringing in relevant information that contributes to the scan field. Sometimes, these networks were combined with Steering Committees or Advisory Groups.

We have also come across efforts to organize broad participation in using platforms, wikis and other such means to make use of crowd or 'swarm intelligence'. We have met considerable skepticism on such methods, mostly associated with the difficulty of motivating volunteers to keep feeding into such systems

If workshops are performed in Horizon Scanning, they are rather small scale (20 persons, in some cases up to 60 persons working in groups) but they are not of the size of conferences.

Indirect participation sometimes includes written expertise from experts with very different backgrounds. In a few exercises, e.g. France Stratégie, a wide-ranging debate with local and national politicians, economists, businessmen and labor leaders and the civil society on the critical issues that the country faces has begun. As there is no

evaluation, yet, we are not sure how successful the Horizon Scanning activity (or even full foresight in this case) is in shaping the policy context, in which they feed.

Participation in Horizon Scanning does not include participation in making decisions. Priority-setting and decision-making is still left to decision-makers (organizers, policy-makers etc.).

## Which types of expertise and skills were necessary?

For automated searches and the full application of toolkits, specific software and programming skills are necessary. Data harvesting, such as Internet download robots and other automated data harvesting, search machines and scanning software, machine learning, textmining for analysis and statistics are necessary in these cases. Other key skills include proficiency in database programming, data analysis, data visualization, data mining and processing.

Other expertise mentioned was more in communication or the specific (e.g. health) sector in order to be able to identify relevant issues and understand the 'language'. Moderation skills for workshops were mentioned. In particular communicative skills, social skills, bibliometrics, specific peer-to-peer interview skills, internet searches, being able to navigate specific social media, communication skills, technical know-how specific to the fields, survey skills, concept skills, workshop concept skills and especially management and coordination skills were mentioned. Analytical skills and social training are regarded as important but also to take over the role as translator, to be the gatekeepers, bricolage players and to understand the urgency to act.

A core skill has to do with understanding the needs of policy for anticipation. This is possibly the most important skill and it is tacit, often learned by doing. Other important skills and knowledge are:

- Analyzing information and putting it into a context
- Professional writing and editing skills
- Researching design skills
- Engaging stakeholders
- Desk research
- Setting up online surveys
- Analysing data from online surveys
- Organising and moderating workshops
- Processing results from workshops
- Storytelling
- Interview skills

## Which type of information is scanned?

In the cases we looked at, all kinds of information are searched for: challenges, single new issues and topics especially in science and technology, interdisciplinary science and technology fields, societal trends, new problems coming up or old problems in a new context as well as behavioral changes in people. It cannot be defined in the same way for all users, what a signal is. Therefore, it has to be decided at the beginning of the scan what has to be looked at during the individual project. Signals are not necessarily new, but they are scanned because of their 'new' or specific connotation in a new context. Thus, for the one project, the signal is new, to others, it is well-known and uninteresting. For the literature on weak signals see e.g. Ansoff 1980; Ilmola and Kuusi 2006 or Hiltunen 2007.

The different types of information were mainly determined by the objectives and the ones who request the information. In some cases, e.g. the German Foresight, BMBF and consortium jointly defined a stringent set of criteria for selecting the future topics and defining a **future topic,** which was searched for or combined from different topics. Usefulness and relevance are often criteria for information selection.

The types of information found in the cases were e.g.

- Information on request of an existing committee: directed by the experts' interest, their information and experiences, scanning was performed, e.g. about public hospitals and very concrete technologies
- Information bottom-up on demand: e.g. in Queensland, diabetes and kidney failure are specific problems due to the rural setting and the long distances. For these problems (identified by practitioners at the location, networks there), solutions are sought.
- National strategies-based information
- Single emerging problems and questions, emerging controversies etc.
- Single 'new' issues, topics, fields, technologies etc. (see also the list of objectives above).

Information selected for horizon scanning is based on a project's thematic focus. When horizon scanning is carried out as part of foresight project's early phases where evidence and signals are collected to support the build-up of different future scenario models, attention is paid to statistical information (economics, migration, demographics) and qualitative aspects, such as signals about future life style, people's sociological expectations, etc.

Information in most cases involves:

- Quantitative and qualitative data
- Publicly available material
- Opinions of experts
- Material available online
- Expert opinions

Other information is provided from tech platforms (through RSS feeds) (eg. phys.org, nature.com, bbc.com, biosciencetechnology.com, etc.). The data are pre-selected here.

## What were the sources?

Sources are the networks themselves, conversations between the different members, e.g. in the meetings, different journals and alerts (see above). Official sources are:

- Information from relevant stakeholders and stakeholder consultations
- Literature analysis
- Publicly available statistics (UN, OECD, Worldbank, European Commission, Dutch planning bureaus)
- Databases of all kinds about expertise, experts and topics
- Academic literature (e.g. scientific journals) and other reports
- Bibliometrics and their databases/ Science Maps
- Patent databases
- Access to Horizon Scanning/ Early Warning Systems in other Countries
- Social media (facebook, Twitter etc.), RSS Feeds, blogs
- The Internet
- Animal studies
- Human Trials - devices or procedures first tested on humans
- Interest group profiles.
- Experts and expert groups, including professional colleges - formal and informal networks
- Conference papers
- Newspapers and other media sources, including financial reports
- Licensing agencies e.g. TGA, FDA, MDA
- Manufacturers
- Monitoring panels

- Scouts and their experience, different organizations who engage in HS or Foresight activities and provide the results, World Economic Forum, Organisation for Economic Co-operation and Development, European Commission Joint Research Council, McKinsey, Accenture, Shell, Forum for the Future, Nesta, or Intelligence Advanced Research Projects Activity, just to mention some examples.

## How are the data filtered, analyzed and how is the sense-making performed? How was HS integrated into foresight and strategic planning process?

In Foresight processes, in which a full integration of HS is intended, the methods are closely interlinked or data are transferred from one stage of the project to another via structured papers, even template-like documents or via Scouts or coordinators. It is common that both, **filtering** the information for the specific users and **adaptation to the users** are necessary.

In some cases (e.g.in the APA in the HybCO2 project producing scenarios for Portugal 2050) filtering was carried out through workshops bringing together external and internal actors. In other cases, the filtering is organized through the people in networks upon networks, in a 'committee' or 'filter group' structure.

The organization performing the filtering or the adaptation can be the **learning organization** itself, as learning requires the ability to design the organization to match the intended outcomes, and the ability to correct the organization's course if the initial direction is not in line with the desired outcome that is required. For this, some organizations have specific *sense making sessions,* which are regarded as a key activity to digest and analyze horizon scanning information.

Another possibility is '**engagement**', within the Public Service and other stakeholders. To keep ahead of a growing demand for information understanding and distribution, a variety of workshops, foresight sessions, training activities and Open Mics are organized and facilitated. **Facilitation methods** help to structure the processes, some of which are mentioned below:

- **Courtyard Café:** This method to orchestrate productive conversations among large groups of people can accommodate anywhere from 100 to 1,200 individuals. Six to eight cafés are set up, each dedicated to a specific topic of discussion, to help compartmentalize sub-topics and then bring them into the larger conversation.
- **Possibilities' Wall:** This is a quick and simple way to make participants identify the challenges around a given issue by posting possibilities on meeting room walls. It is typically used at the beginning of a session, before the group starts discussing solutions.
- **Talk Show:** Using a talk show format, this method provides a uniquely energetic and engaging alternative to traditional panel discussions.
- **Fish Bowl:** In this activity, a small group of participants sits in a circle, surrounded by a larger group of observers. The facilitator or subject-matter expert starts by giving a short talk (5-10 minutes), providing a topic and general outline for discussion. Following this introduction, the inner circle breaks into conversation. The outer circle is usually limited to listening and observing. However, members of the outer circle may participate, provided that a participant from the fishbowl (inner circle) trades places, giving up their seat and moving to the outer circle.
- **Interview Matrix:** This approach is one of the more powerful ways to get all members of a small group (40 or less) engaged in a dialogue. Structured around units of four (four questions, four flipcharts and four people in each group), this method provides a simple structure for what would otherwise be an interaction difficult to facilitate.
- **Visual Facilitation:** Visual or graphic facilitation is the practice of using words and images to create a conceptual map of a conversation. When possible, Horizons integrates visual components into meetings through descriptive agendas, graphic illustrations and other imagery.

**Web 2.0 Tools:** A virtual workspace allows communities of interest to access and actively participate in projects. It provides a practical platform to support collaboration and co-creation over the web. In the project in Romania, a specific web 2.0 platform, Clearspace, as well as GCPedia (internal) and GCConnex (Internal) was used. In one case, a **Delphi survey for assessment** was applied, but no other filters. As Delphi is rather working towards the mainstream topics (if not statistically analyzed in a different, specific way), the really new, changing and therefore 'interesting' topics were evaluated and were not highly rated by the experts. Major criteria in this case were relevancy and impact. If there is a steering committee, the filtering takes place in the steering committee meetings, the expert committee meetings and the last validation in the Delphi survey.

Also **semi-automated ways of pre-filtering** were found (e.g. Romania case, partly by Shaping Tomorrow): The data was filtered, analyzed and made sense of through text-mining and manual clustering. Thus a dossier with information and data was ready, questions could be asked and for further detailing, workshops with experts and policy makers were performed. For filtering the data, an internal software and plagiarism software are used to eliminate duplicates. Sources that do not yield original results are eliminated continuously.

For sense-making, mainly **Future dialogues**[10] are performed, e.g. in Romania or the national Foresight cases.

Romanian example TAGy, in which the findings are used in three ways as input for strategic futures dialogues:

- Open provision of 30 WS per month on facebook
- Entrepreneurial discovery process: NOSEit findings were used to identify actors in certain fields which were then gathered in a workshop to generate entrepreneurial activities in the area
- Brain Romania ('Research facebook'): A consistent repository of emerging issues as a basis for foresight exercises in Romania

Other possibilities to raise attention and promote the findings and discuss them in dialogues are:

- regular high-level expert panels
- series of workshops and seminars
- discussions at national and international scientific conferences
- presentations at the sites of federal and regional authorities,
- presenting to development institutions, business associations, companies,
- including them in technology platforms, innovative regional clusters,
- present to domestic and foreign universities and research centres,
- and international organizations.

In one case, basic IT tools were used to archive the hits and fact sheets (ACCESS database), the following procedure is described systematically with Data filtering:

[10] Future dialogues are workshop formats with discussions about future issues or other expert dialogues, in which different actors are involved.

- use of software to capture websites (zotero, pearltree, evernote, etc.) including meta-data
- researchers assign sources to a pre-defined hierarchical structure
- (+interviews and surveys)

Data analysis:

- content analysis of documents
- theme categorization (STEEP, sectors, key words)
- (+analysis scheme)

Sense-making:

- Expert dialogue (workshop with external experts)

Integration in foresight process:

- integration into strategic planning
- activities (as a result of the concept study): e.g. top-level selects key trends for in-depth trend analysis, preparatory planning of research programs, identification of new internal themes, environmental reporting, etc.
- central management, inclusion of departments and top-level, higher expectations towards foresight unit
- high ranking officials (content must convince)

## Users

Who are the users of HS results? When we interviewed Horizon Scanning professionals, answers from 'all people' to the specific organization the HS was performed for were given. Some interesting answers are:

- the foresight process
- policy-makers in general, specific ones are mentioned in single cases, e.g. the Council for Science, Technology and Innovation in Japan, the highest ranking council in this area with prime minister, ministers, industry and other high ranking experts from science, or The Congress in the USA
- departments of the national government (especially the Ministry for Infrastructure and Environment, the Ministry of Economic Affairs, and the Ministry for Interior)
- regional and local governments (provinces, municipalities)
- planners of basic plans and budgets
- the network itself, which is rather a committee asking for information, processing it and passing it on to ministers
- participants in the workshops, via workshops in the regions, among them are also policy-makers in the regions, citizens and institutions who make use of the information
- the CGSP prepares an annual report, directed at the President and the Prime Minister which is also transferred to the Parliament. The reports are made public later.
- the Foresight community
- in companies: strategy departments or in one case, the Research, Development and Intelligence unit, which employs the studies to support future service and product development; another key user is the Brand development unit, as much of the future oriented intelligence also shapes image and brand activities.
- Concerning industry, it is difficult to say, especially if SMEs are intended to be reached: they are interested and often just say 'Thank you for the information!'
- NGOs
- wider academic community
- external networks are users.

One remark here needs attention: Communication of results 'top-down' (e.g. distributing reports, newsletters, information etc. in the organization from the heads to the officers or middle management) was perceived as flowing quite well. But the bottom-up communication from single officers to the heads of departments, who have capacity and time constraints, was regarded as difficult, especially gaining attention to longer range issues is difficult. This is reported as hampering the real 'use' of the upcoming information (HS results not as important as urgent or daily management).

## How are the results presented and communicated? *Reports, Results, Visualizations*

In most cases, reports of very different formats are found: some are regular (like quarterly or annual reports), others are specific and adapted to the objectives (at the end of a whole foresight activity). In-between there are ad hoc requests that are answered in short papers. Newsletters (printed or electronic versions) often support the regular reporting: raising awareness of scanning, building skills and sharing new scanning resources (e.g. new journal articles, other networks' scanning reports and resources). A Bulletin as a specific form of newsletter was also found. In some cases, the website or platform itself is the communication tool, visualizing the outcomes –no additional material is published. Some more specific examples are:

- Reports with descriptions of scanned topics and issues, answering the questions 'What is it?' 'Why is it important?' and the policy impact for Canada
- Case studies and their descriptions
- Regular briefs on specific topics
- Web 2.0 Tools: a virtual workspace allows communities of interest to access and actively participate in our projects, including a practical platform to support collaboration and co-creation over the web
- Video Clips, web-casts
- Brochures, e.g. brochure on Security Implications of Climate Change in the OSCE region
- A network itself with a platform, e.g. EIONET National Reference Centers for Forward Looking Services & Information
- Workshops in regions as follow-up activities to pave the way for better attention, listening and thus reporting
- Individual presentations or presentations at conferences
- Communication with strategic bodies
- Strategic dialogues as a follow-up
- Interactive website with tables and lists, descriptions of Wild Cards and Weak Signals
- Visual elements
- Policy Briefs (turned out to be quite well read)
- the website as such which is still 'active' although the project ended already
- Narratives
- Manga (comics)
- Direct conversation with high ranking people, e.g. minister
- Address HS/ Foresight in civil service training, as a general task
- leaflet
- TV interviews and presentation on TV
- Target-audience platforms
- Rapid insight studies – reports of 20-30 pages in length, completed in 6-12 week turnaround
- Mini briefings – rapid overviews of key topics, 2-4 page briefings completed within 5-10 days
- Point research – 2-4 hour turnaround for ad hoc enquiries
- Tailored services – workshops, training, ad hoc advice and assistance
- Databases like Sigma Scan, which was the UK database for storage open to anyone who wanted to use it
- Horizon Scanning individual papers

## Is the HS practice/ model perceived as effective by the respective entity and by the clients?

In most cases, the answer 'yes' was given – but in most cases a systematic evaluation was missing. The selected cases give some idea of what was perceived as effective, what was considered as more difficult or challenging and what could be improved.

In cases, were the HS practice was perceived as effective, results were widely shared with different internal and external stakeholders. In individual cases, we found the following factors that contributed to the success: e.g. small movies, input for

newspapers, interviews and lectures at national, regional governments, companies and universities were considered as useful tools for disseminating the results. In some cases the results were used directly, for example in preparing calls for tender in specific fields, but also as input to discussions with management about the potential meaning of the results for an organization or policy domain. In other cases, the results were used more indirectly, for example as input to other foresight activities by other stakeholders.

In some cases, it was mentioned that the results were provided but not fully exploited. There are different reasons for this - beyond simple information overflow. The ones we heard were e.g. a weak link of the HS activity to policy-making, in other cases the scanned issues did not have enough detail or were not sufficiently evidence-based to be discussed and assessed thoroughly with experts and policy-makers, or the HS activity was not directly linked to an ongoing activity, request or strategic agenda. In some cases, there were also problems perceived in translating the results of the Horizon Scanning activity into concrete actions. Within a company case, it was decided to have the HS activity running in parallel with the design and developing activities that will also use the results.

In several cases, it was mentioned that adapting the working format to different clients, project needs and time horizon is essential in achieving useful results. Quick approaches instead of full foresight processes were considered as effective, when the focus of the HS was on the shorter term and pressing issues and targeting specific, single sectors or policy domains. Most of the interviewees agreed that although quick and targeted approaches may be suitable for addressing single issues or policy domains. Nevertheless, a coordinated approach to HS and more integrated into the organization or a full foresight is considered as needed for regular or irregular but continued activities. The reason is that a lot of (different) objectives are to be achieved: to address longer term strategic agenda's, to share knowledge and to avoid duplication between single HS activities but also to consider more substantially alternative future scenarios or to avoid overlooking opportunities and issues that are relevant across domains. To reach these goals, only data, signals or short information without assessment, explanation in the context and priority-setting (filtering) are not sufficient. More coherent work is important to address the (often forgotten) longer term policy issues when faced with many pressing short-term priorities.

Moreover, clear demand from the senior level as well as questions and challenges put forward by the senior level (Director, board, senior management) were considered as being useful and supportive in organizing an effective HS activity that is adapted to the 'customer' and that achieves useful results. If people from the senior level ask for Horizon Scanning and know about the usage including the limits of results, it helps organizers as well as the users to perform adequately and adapt the right HS model. Involving additional stakeholders in the HS activity, who are also the target groups for the results of the HS activity, are supportive in improving the effectiveness of the HS and acceptance of the results as well.

Horizon Scanning has several steps, depending on objectives, expectations, resources and acceptance by the user what is really performed. The following typical stepwise model can be derived from the findings (figure 7). It is a 'full model', not an 'ideal model': If no overview is intended, the model starts with step 2. But in practice only very few actual Horizon Scanning projects include all steps.

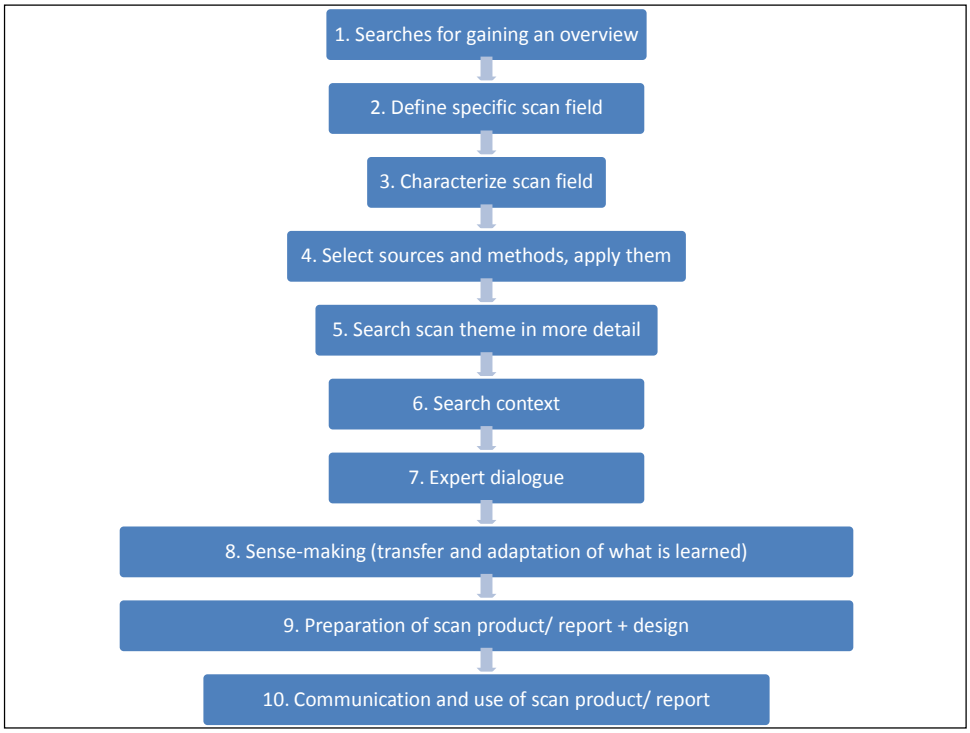



Figure 7: Steps of Horizon Scanning full model (not necessarily ideal model)

With regard to effective tools and methods used in HS activities, it was mentioned that both automated processes and expert judgment are needed. Automated processes are good for collecting and scanning, but expert judgment is needed for filtering, making sense and for combining the material from different angles and perspectives.

Methodological challenges are there anyway, especially when new, digital approaches are used, but also when rather participative and open methods are chosen. It is a challenge to have participants using open digital platforms continuously and to have them contributing in the long run.

## Recommendations for the European Commission

There is not the one-fits-all possibilities Horizon Scanning model for the European Commission. The 'optimal' choice of a model depends a lot on the objectives and what the 'customers' in the European institutions really need. As indicated in the case studies, there are different possibilities. Thus, at the start of a HS, choices have to be made (some are shown in figure 8) among which the most important ones are about the objectives of the scanning approach.

Horizon scanning is seen as being very useful to apply when there is a specific need for it, when there is a gap in the traditional planning process, in the capacity to mobilize external information for decision making. Then, the process of organization and/or reorganization of information with a strategic focus can take place by deploying horizon scanning. The activity may combine different approaches, such as the search for weak signals, emerging issues, anticipatory signals, and interdependencies.

It does not necessarily include consultation with the public or the users. But to be really effective, the idea is that horizon scanning is to be used in response to a need expressed by decision makers (from public or private organizations) and utilizing the own system (combination of approaches). The other possibility is that Horizon Scanning is provoking attention to a warning, a wild card, an interesting finding, a neglected but changed development. This is very difficult as the attention fades away quickly in these cases. Even if the user demanded information on specific topics: by the time it is available, the question has sometimes already been forgotten.

Thus stand-alone Horizon Scanning – contrary to full foresight processes – often needs to **concentrate on rather quick answers**. But also larger stand-alone Horizon Scanning for overview purposes is possible. On the other hand, in full foresight processes, the first phase is always a HS phase. The cases show that every project has 'to go through this phase' in order to search the right finding for the individual case or adapt external findings.

One differentiation is the question if an overview about things to come (e.g. all important R&D-related topics and issues) is sought for or if the topic field is already clear and has to be focussed or filled with life (e.g. searching for the horizon in Nanotechnology or Biotechnology or for Nutrition…). Figure 8 shows the range of possibilities. Left- and right-hand sides are the extreme poles, most Horizon Scanning activities are in the middle or combinations – adapted to the objectives.

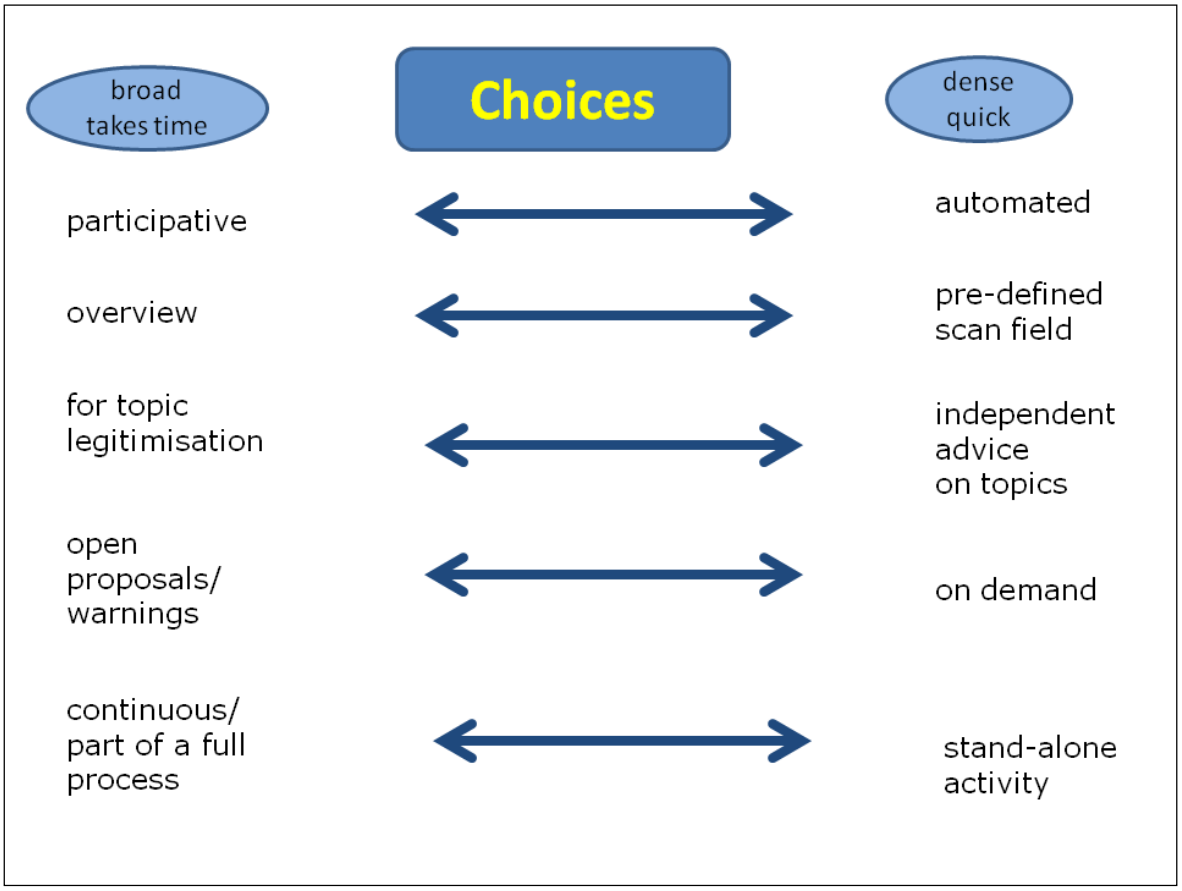



Figure 8: Choices when deciding for a Horizon Scanning model

A very simple recommendation is that clear objectives are needed and criteria derived from the objectives of the Horizon Scan: What to scan? How to scan? This sounds trivial – but is difficult and often forgotten.

Another clear lesson is that automated machine scanning alone is possible, it helps, but is on its own not easy to use in sense-making contexts. Here people (in most cases experts) are needed to assess (sense-making). The transfer from the information collection (Strategic Intelligence) to real knowledge, socialization of the findings (sense-making) for the EU Commission has to be organized (see figure 9).

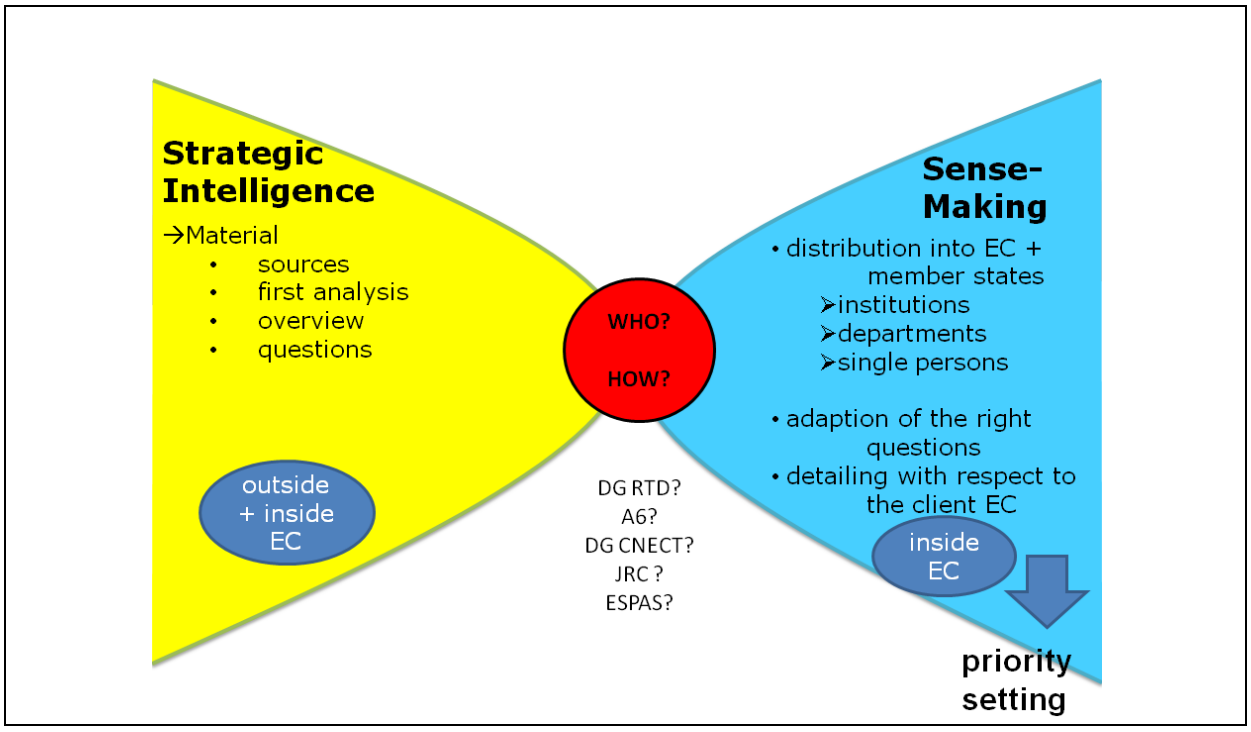


Figure 9: Bridging the gap

This means that Horizon Scanning can be part of a full foresight cycle (every foresight needs a kind of HS) but can also stand alone as just information gathering (strategic intelligence). But in this case, the effect sometimes remains unclear.

Tools (for automation, assessment, etc) are helpful and a data base is needed for storage and retrieval, which can be simple. But this is not the core, it is just a means or an instrument to help. The storage needs to be a continuous activity, which is simple and understandable, and where data can easily be retrieved.

Learning from the different cases, we see that we have a lot of sources to exploit, a huge toolset of methods to be combined, need good people to program the software, to give input, to asses and transfer. We need to visualize the results in an adequate way, but the core questions and challenges that remain are:

- How to gain attention?
- How to keep motivation to participate or use results?
- What to do with results of HS?
- How to communicate HS?

Thus, the major recommendations are:

### R1: A clear organisational structure for Horizon Scanning is needed, addressing functions of coordination and brokerage with users.

A crucial point for bringing useful Horizon Scanning results into the policy-making context is the transfer of these results to sense-making procedures, to assess whether the new ideas or warnings are related to the European Commission and what is to be done with the results. There must be a clear way how information (about risks or opportunities) is transferred and how it can be used as *knowledge*. A brokering function needs to be organized to ensure that the key observations and conclusions can be exploited and reacted to.

There must be a clear way how information (about risks or opportunities) is transferred and how it can be used as *knowledge*. For this, a 'broker' in the system needs to be responsible for the transfer or clear ways of communication need to be institutionalized. The transfer mechanism needs to ensure that the key observations and conclusions can be exploited and reacted to. A nice format of the results adapted to the users' needs is helpful – but it must be target-oriented and match the users' attention level.

### R2: Join forces with others in the EU institutions, and make use of their experiences (DG RTD, JRC, DG CNECT, ESPAS...).

There are different locations in the EU institutions where Horizon Scanning is already performed or HS results from other institutions enter the EU system. In order to generate new HS information on the one hand and guide the results to the proper users or sense-making entity on the other, it could be appropriate to join forces, within the European Commission (building on competencies in the EPSC[11], DG RTD, DG CNECT, and the JRC) and across the EU institutions under the umbrella of ESPAS (the European Strategy and Policy Analysis System).

As a core institution, an inter-departmental and inter-institutional group that consists of persons from all user and provider institutions (minimum participation: JRC, DG CNECT, A 6, ESPAS, EPSC) is recommended.

[11] The European Center for Political Strategy

### R3: More demand-driven Horizon Scanning: Work bottom-up in order to learn about the knowledge use of the applicants.

Demand articulation is very important for profitable use and a well-directed search. Therefore, the users should be listened to in order to know how they apply their knowledge and what is needed. Bottom-up work helps to bring in this demand articulation.

On the other hand, the demand for HS also in the EC and the institutions needs to be stimulated – by talking to the persons who might have a demand, by informing the institutions and by just experimenting. This has to be accompanied by a call for more openness by the EC.

### R4: The implementation of HS results has to be thought through from the beginning or the HS needs to be integrated into a full Foresight.

The diffusion of pure Strategic Intelligence results (data, figure, facts) or just machine-generated results is rather difficult and often remains unclear in use, purpose of the Horizon scanning activity and perception. This has to be clarified from the beginning. Both the purpose of the HS activity and the idea of how to make use of the data should be clear. Alternatively, Horizon Scanning is an input into a full Foresight process (one including selection, priority-setting, implementation). Horizon Scanning results can only play a role in the policy-making context if they are the right ones which are demanded or if they meet a specific interest, if they are accepted and provided in a 'transportable way'. Another possibility is Horizon Scanning on demand – in this case the scan field has to be defined clearly directly from the beginning. Openness by the EC is required so the results can be fully used.

### R5: Continuous Horizon Scanning and stand-alone projects – both are necessary.

Continuous Horizon Scanning processes provide individual users with information that might be of interest to them. More and more automation (searches, storage, permanent monitoring, first filtering, then extracting information) is possible and tested in this field. As the user can define what is of interest to her- or himself, this kind of scanning should meet his interests. But reality shows that very soon the individual suffers from information overflow. This means that the information is not paid attention to so that it is not transferred into actionable knowledge. In these cases, or from time to time, stand-alone projects are necessary. Their purpose might be to gain a new overview, maybe from a different perspective. Another aim can be to start searches and scans in a limited field of interest. Then, the interest to pay attention to the results should be greater as the whole project answers to a demand.

### R6: Expert (human being) involvement is necessary to transform information into actionable knowledge.

Automated Horizon Scanning is possible and will be enhanced but has clear limits. People can be assisted by automation but they cannot be fully replaced when it comes to assessments, decisions and the transfer into real action. Human beings are still necessary to coordinate the processes ('scanners') and to assess the topic according to different dimensions, to coordinate different fields, take into account the knowledge of different disciplines, and to deepen the analysis.

To clarify the difference: If you are operating for example a pension scheme routinely, you can delegate it to a machine, but if it is about challenging the system and developing a strategic view of it (How does it develop? What happens if there is a smaller working population?), then human experts need to be involved. There is also the issue of cross fertilization: the more distant and remote some theme areas are, the more difficult it is to see how they are related, the more you need humans. The definition of 'expert' in most cases can be rather broad – human beings are needed to focus, validate, make sense and bring in different perspectives. For issues that cannot be explained with a single phrase but have to be described, automation is no solution. To translate the

information into real action and implement it humans are still the key – they are the actors.

### R7: Sense-making and Horizon Scanning need to be separate steps – both are needed. For sense-making and assessments, also different stakeholders should be consulted.

For Horizon Scanning as gathering strategic intelligence information, scanning and searching is the first step, but to assess the information, transform it into knowledge and ask the question what it means in the specific case (for the sponsor, for the organisation, for the decision-maker who asked…), is a different issue. For this sense-making, the strategic view (see above), assessment criteria and the implications are important. Therefore, different stakeholders in the own organisation or – if it is needed to have a kind of 'neutral' or 'open' view – even external actors are also necessary for sense-making. They open the box in order 'to think outside the box' and broaden the perspective. External persons can be 'experts' in the classical sense (academics) or those who are affected, e.g. housewives, citizens just picked from the street, handicapped people, extreme sports amateurs, policy-makers or others who might know.

### R8: Method capability – understanding of HS methods in the Commission

In order to make full use of the toolbox for Horizon Scanning and the methods that can be combined or are complementary, at least a broad overview of the methods and their state of the art is necessary. To really understand what kind of results a method produces which is necessary for practitioners – decision-makers and users need to understand what the data or information mean and which context they are derived from. Only then they can be fully understood and used.

One important element that needs to be understood by every user is that extrapolated or estimated data and results from Horizon Scanning may be the best information available about future issues. They are generated with rigour and thoroughly discussed - but they are neither self-evident nor universally true.

### R9: A tool is only useful if users have the knowledge to make sense of it and exploit it.

A tool for automated, semi-automated or qualitative scanning and searching is very helpful. But it needs to be directly applied in these cases, even for assessments or in workshops. It should include algorithm searches, assessment and discussion instruments. A storage system for the findings is also needed, but the tool should not be for storage alone. Instead, it needs to be something to actively work with, where data can be retrieved, assessed and exploited – but it needs also to be simple.

### R10: Potential users of HS need to know what is possible. They need to be integrated into search and sense-making.

The best way of understanding users' demand is to integrate it into the definition of the scan field, the searches and the sense-making. They are not supposed to give advice to themselves but to guide the search and clarify what is really needed. Then, the users also understand the limits of Horizon Scanning (both: limits of the method and limit of the horizon that is scanned).

### R11: Translate the results into the users' language at the right point in time.

Use simple language related to the issue, not jargon. Translate into the language of the users, in this case the European institutions. The results have to be present at the right point in time and given to the right place and user in this specific time frame (e.g. according to the policy cycle and the European calendar).

### R12: Horizon Scanning should include History Scanning as an experiment – look at H2020 and FP 7.

People tend to re-invent the wheel. But very interesting and sometimes neglected results already exist. Therefore, History Scanning that looks at the projects of H2020 and FP 7 (or even earlier) is recommended in order to learn about the horizons of that time and also findings that can be 'revived' and re-exploited. Sometimes these findings were too early at the time they were generated and now, with a different view, they have a different meaning and are useful again. Learning from earlier experiences will have effects (also learning from the former methods applied).

### R13: Experiment with short processes on demand in a given field of search.

The major recommendation from the workshop in November 2015 is: 'just do it'. Try it and experiment with short processes on demand in a given field of search. Train the knowledge, learn the methods by doing. This means that there must be of test beds and 'free zones', in which the interesting results are used – but mistakes can be made and serve as learning experiences. This will also spread the tacit knowledge of 'how to do it' to other people and units in the European institutions and the real users. Such an approach will create more demand for Horizon Scanning, too, and a better understanding of the possibilities.

## Summary

Until now, a lot of Horizon Scanning activities have been performed in many parts of the world, of course also in Member States of the EU and in the European Commission. The problem is one of knowledge management: The amount of information is very large, very diffuse by content and often generated with an unspecified user groups in mind. This led to the fact that the best users or those 'who should know' were not reached or did not pay any attention.

- To fill this gap – which is in fact a gap between Strategic Intelligence and Sense-Making, coordination should take place, which can be organised institutionally (new virtual distribution point/ platform), by a group of organisations or departments (e.g. JRC, ESPAS, A6, DG CNECT, EPSC or others) or by a single entity (e.g. A 6).
- The entrance point needs to be a broker in the system and distribute results to the users who should know.
- Methods and sources for information should be chosen accordingly (not the other way round: methods are available and objectives are chosen).
- As sources, internal sources and History Scanning (e.g. FP 7 or H2020 material) are as interesting as external sources.
- The individual model of Horizon Scanning has to be adapted to the objectives, backgrounds and of course resources, competences and capacities.
- For the sense-making, real human beings are needed, whereas for the first collection of material, parts of the procedure can be automated.
- Horizon Scanning activities which try to gain an overview are much more resource-intensive than those starting with a pre-defined field of scan.
- Horizon Scanning can be a continuous activity (regular newsletters) or on demand/ stand-alone.
- Building up a permanent infrastructure (also for automated HS) and to maintain it continuously, is resource-intensive and only recommended if long-term motivation to use it can be expected.
- The ideal is embedding HS into a continuous procedure or a full foresight cycle.
- Adaptation to the timing of the users (e.g. policy cycle) is necessary.
- Teaching and training on the spot should be possible – to spread information and also to create demand for Horizon Scanning.
- A larger project to test the possibilities is recommended.
- Smaller test beds and 'free zones' for testing Horizon Scanning in different contexts should be provided. 'Just do it' was the major recommendation from the workshop.

# ANNEX

## Annex 1: Relevant Publications

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- OECD: http://www.oecd.org/dataoecd/22/56/39991237.pdf

## Annex 2: Cases

| national HS | Method/ Contact points | Partner in the consortium |
|---|---|---|
| Risk Assessment and Horizon Scanning Programme Office Singapore | scanning documents and internet page | ISI |
| Australasian Joint Agencies Scanning Network, including the Australia and New Zealand Horizon Scanning Network (ANZHSN) | documents, interview | ISI |
| The Central Planning Bureau NL | documents, direct insider knowledge, interview | TNO |
| Finland Future Watch, Tekes – The Finnish Funding Agency for Innovation, Finland | documents, direct insider knowledge, interview | VTT |
| Horizon Scanning Centre UK | Description and Database of the Horizon Scanning Centre, interview | ISI |
| Policy Horizons Canada | documents, study, interview | ISI |
| project NOSEit, Executive Agency For Higher Education, Research, Development and Innovation Funding (UEFISCDI, RO) | direct contacts, interview, material | ISI |
| Department of Strategies and Economic Analysis at the Portuguese Environment Agency (APA, PT) | documents, interview | VTT |
| National Foresight of South Korea, Future Strategy Centre, S&T Policy Institute (South Korea) | documents, interview | ISI |
| Estonian Institute for Futures Studies | documents, interview | VTT |
| Commissariat générale à la strategie et la prospective (CGSP, France) | documents, internet platform, newsletters, interview | ISI |
| National Institute for Science and Technology Policy, Japan, NISTEP: 1. Horizon Scanning project and 2. Foresight 9 | own documents and publications, original material (in Japanese and English), interview two responsible persons | ISI |
| Strategic Futures Group, National Intelligence Council (USA) | documents, internet pages | ISI |
| Government Accountability | documents, interview 2 responsible | |

| | | |
|---|---|---|
| Office (GAO) | persons | |
| Bundesministerium für Bildung und Forschung - BMBF Foresight Cycle I and II, Germany | own documents, insider knowledge, ISI was manager in the first/ partner in the second process | ISI |
| **other multinational approaches (according to the TOR)** | | |
| The iKnow project | data base, documents, interview | ISI |
| European Environment Agency (EEA) | documents, interview | ISI |
| OECD | documents, interview | ISI |
| **private companies** | | |
| Kone | short document screening, interview | VTT |
| Philips | documents, interview, internal project | TNO |
| Shaping Tomorrow (e.g. as Horizon Scanning Service for EIRMA members) | documents, database and newsletter, interview | ISI |
| **other approaches (proposed by the consortium)** | | |
| SESTI (as mentioned in the ToR) | own documents, project contributions from TNO | TNO |
| JRC Horizon Scanning | interview, newsletter | ISI |
| Netherlands STT Horizon Scan 2050 | documents, interview | TNO |
| Horizon Scanning at the Higher School of Economics (national Russian Foresight) | documents, interview with our cooperation partners at HSE, official information from the International Advisory Board (member: Cuhls) | ISI |
| Horizon Scanning, currently implemented process, Federal Environmental Agency, Germany | report, interview | ISI |
| Euroscan | internet page, recommendation from Australia | ISI |

## Annex 3: Procedure of the study

The procedure of this study was the following:

Literature was searched and scanned. From this and internal knowledge, cases and interview partners were identified and added to the list of pre-identified cases provided in the tender.

Qualitative material about the cases was analyzed. Sources were books, reports, papers, internet pages, and other documents. All documents detected were stored and the content was filled in the templates (copied or summarized), see Annex 4.

Where possible, interview partners were identified to give specific relevant information. The interview results were documented and added to the respective country case template.

The templates were analyzed according to the category asked for in order to find similarities, differences, factors contributing to the success of the project and others. These specific aspects are described in the 'Analysis' part of the study. Recommendations were derived from this.

It has to be taken into account that the cases were chosen according to 'positive results', 'use' or the availability of interview partners and knowledge provided as open material. Therefore, the negative aspects and failures are not in the forefront.

## Annex 4: What are the necessary resources?

In the template, the question about resources was raised. But as only a few cases were selected and answers are not always available, the results just tell us the following: Concerning the financial resources, the range for a full foresight with 4.5 mio Euro for 2 years to 2.6 mio Euro altogether were mentioned. HS activities with 1 mio Euro in 3 years were found as well as 250.000 Euro altogether, or no fixed budget but payback via the clients/ users.

Concerning the staff, there are small activities with two persons managing the whole process automatically to 3-8 person years annually. As many external people are often involved (experts) for interviews or workshops, who are not paid, this depends on the ability to convince these people to participate – less on staff employed. In the larger foresight activities with coordinators, up to 40 people were involved according to their background knowledge, but not full time. In one case, an efficient and 'cheap' business model with only two full-time employed persons in the main organisation was run with ad hoc employed additional personnel when needed – they were cheaper but also worked full-time on the projects.

## Annex 5: Template for Interviews, Scanning the Projects and Analysis

The following categories had to be filled in:

**Country**:

**Name of the Horizon Scanning Process(es)**:

**Year and Duration of the Process(es)**: (20xx-20xx)

**Financed by**: *(name of the financing institutions)*

**Operated by**: *(fill in the institution running and organizing the foresight here)*

**Objectives**: *(process objectives and/ or intended results)*

**How is it organized** *in relation to the policy-makers who may use its results (in-house versus external, central vs. decentralised; horizontal vs. thematic; institutionalised vs. specific to the project)?*

**Scope** *(in time as well as thematic content/ policy sector)*

**Thematic Focus**: *(please list the topics/issues or explain the focus here, if there is any – otherwise it is 'overview')*

**Which type of information is scanned?**

**Participation**: *(please mention the number of direct participants and their backgrounds/ scope)*

**How is the approach of scanning carried out?** (*What are the methods and tools that are used? How do they make use of human involvement and participation? What emphasis is placed on evidence-based and on creative activities?)*

**Which types of expertise and skills were necessary?** *(e.g. specific software skills, internet searches, textmining, other)?*

**What were the sources** *(e.g. in the organisation itself/ in other organisations/ (scientific) literature/ media/ interviews (with whom?)/ the internet/ other)?*

**How are the data filtered, analysed and how is the sense-making performed**? **How was HS integrated into the overall foresight process and into the strategic planning process?** (*Is there a link to sense-making or is the Horizon Scanning embedded into the process? How?)*

**Users:** *(If possible, please specify direct or indirect users, you can also characterize them, you can also integrate this into the 'experiences')*

**How are the results presented and communicated?** (*Are there specific categories of 'clients' for the different HS elements? Is this done with the help of editorial committees? If yes, how are they composed and are there different committees for distinct target groups?)*

**What are the necessary resources?** *How much is invested in HS activities? Are investments in HS increasing or decreasing in the current context/ recent past? Why?*

**Is the HS practice/ model perceived as effective by the respective entity and by the clients?** *What are the perceived strengths and weaknesses of the respective model? What are possible improvements from the perspective of the provider as well as the clients?*

**Other experiences in implementation**: *(please explain here, what you think is interesting, astonishing etc?)*

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Horizon Scanning is the systematic outlook to detect early signs of potentially important developments, in order to enhance resilient policy-making, address policy makers' needs and concerns regarding new issues, to identify business opportunities by anticipating consumer and societal needs or to prepare society for less expected or rapid changes.. During the last few years, different 'Models of Horizon Scanning' have been developed; method-combinations have been tested and implemented. Specific 'Horizon Scanning' institutions have been set up in some countries. The report presents an overview of the latest developments with a view to identify good practices and draw lessons for Science, Technology and Innovation Horizon Scanning in the European Commission.

*Studies and reports*




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