

Elina Hiltunen

WHERE DO FUTURE-ORIENTED PEOPLE FIND WEAK SIGNALS?

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SUMMARY

Weak signals and environmental scanning have been discussed diligently in the literature since the famous works of Aguilar (1967) and Ansoff (starting from the 1970s). For example, many studies about different aspect of environmental scanning process have been accomplished. Weak signals, on the other hand, have not been considered in strategic literature to such a vast extent. Specially, there is a lack of theoretical studies of how business managers or futurists scan and use weak signals, which here refer to signals of possible change.

This study focused on the sources of weak signals in anticipating future changes. The main research question of this study was: *Where do future-oriented people find weak signals about forthcoming changes?* The target groups of the study were futurists and future-oriented people, who were selected because of their natural tendency to scan for weak signals of change in their work. Also, these people are considered by me to be pioneers in looking at the future.

The study was completed in two phases using Webropol's (www.webropol.com) Internet questionnaire. First, a small pilot study was accomplished at Finland Futures Research Centre (FFRC) mainly to test the functionality of the questionnaire. Based on that, some minor changes were made to the questionnaire. The primary international research was done in spring 2007. In this research, an invitation to participate the research was sent to as many futurists and future-oriented people as possible by various channels. The total response rates were 20 people for the pilot study at FFRC and 121 for the international study.

The results of these studies show that ranking of good sources of weak signals varied according to the area of life. The top five of good sources of weak signals (all areas of life included in order of superiority) in the international study were: scientist/researchers, futurists, colleagues, academic and scientific journals, and reports of research institutes.

Human sources were the most appreciated in all areas of life. This supports the findings of previous studies.

Experience in the futures field, gender or homeland (continent) of the respondent did not seem to affect the appreciation/use of different categories (human/textual/online) of sources. However, because of the lack of random sampling, these results are only suggestive.

Even though this study did not focus on the processing of the weak signals, some valuable comments were collected from the respondents' answers. Interaction, openness and discussion were emphasized in finding weak signals. More generally, keeping eyes open, having sensitivity to changes, creativity, receptiveness, intuition and a curious mind is needed to find weak signals of change.

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1 ANTICIPATING CHANGES BY USING WEAK SIGNALS AND SCANNING THE ENVIRONMENT

In anticipating future changes there are two key concepts that are related to this paper: emerging issues and weak signals, which are the first things for us to see about forthcoming changes. Weak signals and emerging issues have been discussed by many researchers (see e.g. Ansoff [1, 2, 3, 4, 5], Webb [6], Coffman [7, 8, 9, 10, 11], Blanco and Lesca [12], Harris and Zeisler [13], Day and Schoemaker [14], Mannermaa [15, 16, 17], Hiltunen [18, 19, 20, 21, 22, 23, 24], Kuusi et al. [25], Nikander [26], Moijanen [27], Ilmola & Kuusi [28], Uskali [29], Brummer [30], Kuosa [31]). Sometimes weak signals and emerging issues are considered as synonyms, but Hiltunen [32] has made a distinction between them by presenting the concept of *future sign*, in which weak signals are understood more as signals or signs of the emerging issues. The future sign also includes a third dimension, the interpretation, which means the sense the observer makes out of weak signals and emerging issues in regard to future.

For anticipating changes, it is important to look for emerging issues and weak signals of them from all around us. This activity is called environmental scanning. Aguilar [33; p. 1] defines environmental scanning as “an activity for acquiring information.” He continues [33; p. 18] that “scanning involves simply an *exposure to* and *perception of* information. The activity could range from gathering data in the most deliberate fashion—as by an extensive market research program—to undirected conversation at the breakfast table or the chance observation of an irate housewife throwing your product into trash barrel.” Choo [34] defines that environmental scanning analyzes information about every sector of the external environment that can help management to plan the organization’s future. Cook [35] comments that “environmental scanning is the practice of searching a wide array of information sources on a regular basis for symptoms of change.” Neufeld [36; p.39] crystallizes the usefulness of environmental scanning: “It **can** provide a view of future conditions in the context of what current events and changing

conditions might mean for established assumptions. At best, environmental scanning is a heuristic tool providing information to decision-makers and analysts as stimulus to their imaginations.”

1.1 Where and how do changes happen and where do emerging issues appear?

For finding out where to scan weak signals for anticipating the future it is important to understand the logic of change. Ferguson [37] argues that few changes in the environment occur spontaneously: they start as ideas. These ideas eventually obtain a public expression in the press, radio, television, university conferences, and scientific journals. Dator [38; p. 205] describes changes in the following way: “The world around [them] is emerged according to various kinds of “S” curves of growth— from nothing but some crazy idea, to a frail and flimsy emergence, through a slow initial growth and then rapid middle growth, to a hard omnipresence, to steady prolonged “commonsense” existence, and/or to eventual decay and death.” Dator [38, p. 205] continues that “many futurists attempt to look for what might later become trends in their earliest stage of development as emerging issues, while they are still weak, obscure and fragile, assessing how they might grow, and weather their growth should be encouraged, discouraged, or ignored.”

According to Dill [39] “from an information perspective, every change or development in the external environment creates signals and messages that an organization may need to heed.” Choo [40, p. 112-113] continues that some of the signals would be weak (difficult to detect), many would be confusing (difficult to analyze) and others would be spurious (not indicative of a true change).

There are some theories concerning the sources in which an issue appears at different stages of its existence. For example, Molitor [41] has presented his forecasting model where he discusses the patterns of change. This model has been studied carefully for example by Harris [42] . Molitor’s earlier ideas about anticipating changes from the 1970s have been represented and refined by Wygant and Markely [43]. Based on that, Choo [44] has modified an information life cycle of emerging issues which is seen in Figure 1.

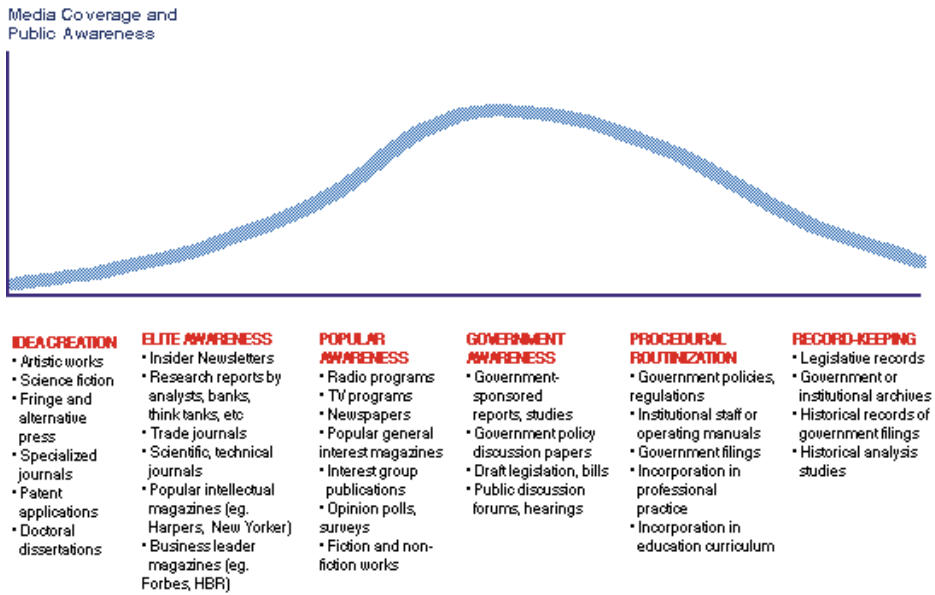


Figure 1. Information life-cycle of emerging issues by Choo [44], adapted from Wygant and Markley [43].

From the figure it is possible to see different stages in the public awareness/media coverage when the issue is emerging. The first two stages are named by Wygant and Markley [43] as *idea creation* and *elite awareness* phases. In these stages, the idea appears to public for the first time. Thus, sources like artistic works, science fiction, fringe and alternative press, etc. listed in these stages are good for finding weak signals of emerging issues. An important update for these results is mentioned by Day and Shoemaker [45], who underline the periphery as a source of weak signals for the future. Day and Shoemaker [45: p. 56-59] emphasize the potentiality of Internet and blogs as good sources for scanning the periphery.

Besides of the categorization discussed above, there are other ways to categorize the sources of information presented, for example, by Aguilar [33:p.66], Neufeld [36: p.48], Webb [6: p.107], and Keegan [46]. In the empirical part of this paper, however, Choo's [47: p.139] division of sources of information into three categories is used. These categories are: human sources (internal sources and external sources), textual sources (published sources and internal documents) and online sources (online databases, CD-ROMs and Internet resources).

1.2 Characteristics of sources used for environmental scanning according to academic studies

According to literature, there are some elements and types of sources that are more appreciated in anticipating changes than others. Aguilar [33; p. 68] found in his study that managers relied almost as much on inside sources as on outside sources for important external information. Personal sources greatly exceed impersonal ones in importance. Aguilar [33; p. 68-69] draws conclusions that scanning process for important external information appears to rely heavily on the manager's personal network of communications. The similar conclusions about importance of managers' personal network was also found out by Heikell [48] who has analyzed a few books and some 40 articles of sources in scanning activity. Choo's [49], El Sawy's [50] and Keegan's [47] results are also pointing to this direction. Choo [34;p. 141] has specified that information from human sources may be preferred when dealing with ambiguous, unstructured problem situations.

Other characteristics too affect the use of a source in environmental scanning. O'Reilly [51] has found that the quality and accessibility of a source affect its use in scanning. Saunders and Jones [52, p. 32-33] summarize some of the characteristics that have been cited in literature as a reason for selecting information sources. These characteristics are: urgency, accessibility, cost, feedback, channel capacity, symmetry of channel capacity, time, speed of message handling, information richness, and "social presence".

The literature reviewed above was a starting point of the empirical study of this research on sources of weak signals. Based on the literature and previous research reviewed here, there arose some questions to which this study aims to provide answers. The research questions are presented in the following section.

2 EMPIRICAL STUDY OF SOURCES OF WEAK SIGNALS

The aim of this study was to collect information about the sources that futurists and future-oriented people use in their work to spot weak signals for anticipating changes in the future. Weak signals themselves are a very interesting research topic because they can foretell changes in the future. When a futurist is working with future issues and making, for example, scenarios, his/her work is to scan the environment to spot the possible changes in the future.

I have interviewed Finnish futurists and people working with product or service development in two companies in years 1999 to 2001 to find out how they scan the environment to find weak signals for their work [53]. From these interviews came the idea of doing more wide, quantitative and international research on what sources futurists seek weak signals from. But before conducting the international study, I wanted to test functionality of the questionnaire by doing a pilot survey of people at Finland Futures Research Center (FFRC).

This study aimed to find answers to some questions that came to my mind while going through previous studies in this area. Also, my experience in this field has raised some questions that the study seeks to answer. The research questions are the following:

- What are the sources futurists or future-oriented people consider good for finding weak signals?
- What sources are considered good in different areas of life ?
- What categories of sources are preferred in finding weak signals?
- Do certain background factors of the respondents affect to the use of sources of weak signals?

Although the research was mainly conducted as a quantitative study, a small part of the research data was in the qualitative form. The questionnaire of this study was done in electronic form, using a software provided by Webropol (www.we-

bropol.com), and it was sent to the respondents as a link (individual or public). The questionnaire consisted of four pages. The questions in the first page inquired the background information of the respondents (demographic factors) and the level of the expertise in futures field. Pages 2 and 3 focused on listing the sources of weak signals. In those pages, the respondents were asked to mark the area of life they follow the most (referred to as priority 1 in this study) and the second most (referred to as priority 2). Then they were asked to tick from a list the sources of weak signals they consider good for the chosen area of life. Also, the respondents were asked to mark the best and second best sources. In the last page, the respondents were allowed to write freely about good sources of weak signals. They also had the opportunity to comment on the questionnaire. To look at the definition of weak signals the respondents were given in the questionnaire and construction of the questionnaire, see Appendix 1. The questionnaire was slightly changed for the international study on the basis of the experiences from the pilot study at FFRC.

2.1 Information about the studies

The pilot study of sources of weak signals was conducted at Finland Futures Research Centre between February 6th and February 14th, 2007. A link to the study was sent via an email-list to all the employees in FFRC on February 6th. The message was sent to 44 people via this address. All in all 20 people responded to the study, which makes the response rate 45.5%. However, not all people (like secretaries and administrative personnel) on the email list could be considered as the target group of this study, a fact raises the response rate a little. Results of this study will be looked at briefly in this report, because the main emphasis is in reporting the results of the international study.

The international study of sources of weak signals was accomplished between February 20th and April 2nd, 2007. The link was not accessible during week 12 because the study was first closed on March 16th. Because of the late announcement in the *FutureTakes*, the study was, however, reopened for a week, and it was permanently closed on April 2nd.

The target of the researcher was to send the questionnaire to as many futurists as possible. The link to the questionnaire of the study was sent to the following groups of people:

- contact network of the author
- speakers of World Futures Society's conference in Toronto, 2006
- CostA22 board members
- some consultant offices in the futures field (contact information found from the Internet)
- Millennium project email lists (public and nodes)
- WFSF email list.

The link to the study was also published in:

- the Internet pages of the Future Foundation (www.futuresfoundation.org.au)
- FutureTakes (Winter 2006–2007).

It is impossible to say the number of people who received the link to the study, and thus the final response rate remains a mystery. In order to ensure the future orientation of the respondents, the questionnaire included some questions that were aimed to test the future expertise of the respondents.

2.2 The pilot study at Finland Futures Research Center

The pilot study of sources of weak signals was conducted in Finland Futures Research Centre (FFRC) between February 6th and February 14th, 2007. The purpose of conducting this pilot study was to test the questionnaire in practice before using it in the international study of larger scale and to get some preliminary results with regard to where the weak signals are spotted. Here the results of the study are discussed very briefly.

2.2.1 Background information of the respondents

Background information like age, gender, country, and futures works of the re-

spondents were asked in the beginning of the study to get a better view of the demographic facts of the respondents and the level of professional skills. The ages of the respondents varied from 21-60 years in a way that age group 31-40 appears to be the major group (45% of the respondents) and the second biggest was 41-50 years (30%).

Most of the respondents (75%) categorized themselves as futurists, which was more closely defined in the questionnaire in the following way: *futurist (for example futures consultant or professor or researcher in future studies)*. Researchers in areas other than future studies were the second biggest group (20%). To more specify the level of knowledge of the futures studies, the respondents were also asked about their experience of “looking at the future.” 15% had experience of less than 2 years; 35% of the respondents had 2-5 years of experience; 30% had 5-10 years of experience; 5% 10-15 years and 10% more than 15 years. There was also one respondent with no experience of looking into the future. This respondent was excluded from the analysis of the study. Because of the overlapping of the timings (2-5 years, 5-10 years, etc.) the scaling of the timing for the next questionnaire was changed (2-5 years, 6-10 years, etc.) in the international study.

2.2.2 Results of the pilot study

The respondents were asked to mark the area of life (modified PESTE or STEEP) which they follow the most (priority 1) and second most (priority 2) and the sources that they consider good in finding weak signals in this area of life. The respondents were also asked to mark which of those sources are the best and second best for finding weak signals in that area of life.

The good sources for weak signals mentioned by the respondents were ranked in the order of superiority by the areas of the life. However, there were too few responses ($N < 5$) in the following areas of life in order to use the data in the analysis: politics, environment, education and learning, health and fashion. The top ten good sources of weak signals in the areas of technology and science, economics, and society and culture according to the FFRC respondents are shown in Table 1. The results were received by ranking the sources of all three areas in the order of superiority and then adding up these rankings.

Table.1. Top ten good sources for weak signals according to FFRC respondents (technology and science; economics; society and culture).

number of order	A good source of weak signals
1.	colleagues
2.	scientists/researchers
3.	television/radio
4.	futurists
5.	academic and scientific journals
6.	movies
7.	consultants in areas other than futures
8.	Internet: companies' or organizations' web pages
9.	popular science and economic magazines
10.	Internet: electronic journals

From Table 1, it can be noticed that human sources,¹ such as colleagues (who in this case very mostly futurists), scientists/researchers, futurists, consultants in areas other than futures, and ordinary people were appreciated in the top ten list. Textual sources, such as television/radio, academic and scientific journals, movies, popular science and economic magazines, were appreciated by the respondents. Of the online sources, the websites of companies and organizations and electronic journals were appreciated.

In the analysis, I also wanted to sort out what are considered as good sources of weak signals in different areas of life. In the following results, all the sources mentioned in particular areas of life (both priority 1 and priority 2) were added together.

1 About the categorization into human, textual and online sources see Appendix 2.

Economic and business changes were followed by altogether 8 respondents. Good sources for finding weak signals in this area were television/radio (N=8), media people (N=5), academic and scientific journals (N=5), company and organization websites (N=5). The following sources were mentioned four times (N=4): colleagues, scientists/researchers in universities or institutes, futurists, consultants in areas other than futures, ordinary people, popular science and economic magazines, local newspapers and electrical journals on the Internet. The respondents also mentioned a variety of other sources.

Changes in society and culture were followed by 11 respondents. The most popular sources for finding weak signals in this area of life were futurists (N=8), ordinary people (N=8), colleagues (N=7), scientists/researchers in universities or institutes (N=7), Internet discussion groups (N=7), television/radio (N=6) and science fiction movies, books, etc. (N=5), movies (N=5), marginal/underground press (N=5), and family/friends (N=5). A variety of other sources (N ≤4) were mentioned.

Changes in technology and science were followed by 9 respondents. In this area of life, scientists/researchers in universities or institutes were mentioned most frequently as good sources of weak signals (N=7). Reports of research institutes and company or organization websites were the second most mentioned (N=6). Patents (N=5), futurists (N=4), consultants in areas other than futures (N=4), academic and scientific journals (N=4), market research studies (N=4) were also listed as good sources for finding weak signals. Various other sources too were mentioned three times or less.

Changes in the environment, learning, education and fashion were followed by less than 5 respondents. The results of these categories are not presented in this report owing to low number of respondents.

In the questionnaire, the respondents also had the opportunity to write comments about good sources of weak signals. In the comments (altogether 15), certain themes appeared frequently. One theme raised by the respondents was that weak signals are found in dialogue with people (keywords: networks, discussion

forums with no formal restriction, discussion with people from different professional areas). Open-eyed observation of everything (everyday life, traveling) was also mentioned as a way to look for weak signals. The importance of lead users like artists, professionals and influential people were also emphasized.

The respondents also had a chance to comment on the questionnaire. It received neutral and positive feedback from the respondents. However, on the basis of the pilot study some minor changes were done to the questionnaire. Perhaps the biggest change was giving the respondents an opportunity to tell why the “best sources” of weak signals were so good. Also, two sources were added to the list of possible sources for weak signals.

2.3 International study of sources of weak signals

The international study of weak signals was accomplished during spring 2007 using an Internet-based questionnaire provided by Webropol (www.webropol.com). A request for future-oriented people to answer the questionnaire was sent via different channels (email, the Internet). Because of this, it is impossible to define the response percentage of the study. All in all, 121 people responded to the study. To make sure that the respondents were suitable for this study (i.e. had experience in working with futures issues) their background in futures was asked.² Those who did not have experience in working in the futures field were dropped out of the analysis (N=1). Also, people who did not answer that question (N=2) were dropped out of the statistic calculations. This makes the total number of respondents 118. However, all respondents did not answer every question. This is why the number of respondents is shown with the results.

2 In question 5 in the questionnaire, experience in futures field was asked (“Your experience in “looking into the futures”). Alternatives ranged from none to over 15 years.

2.3.1 Background information of the respondents

The average respondent of the study appeared to be an experienced male futurist. Unfortunately hardly any young futurists responded to the study. Out of 118 people who answered the question about age, 5.9% were 30 years or younger. 11.9% belonged to the age group 31-40 years, 28.8% of the respondents belonged to the age group 41-50 years and the same percentage was valid for the age group 51-60 years. Rest of the respondents were over 60 years (24.6%). Nearly 74% of the respondents were male and 26% female (N=114 respondents).

The majority of the respondents (N=118 respondents) lived in Europe (44.9%) and North America (37.3%). A few people from Australia and Oceania (5.9%), South America (5.1%), Asia (4.2%) and Africa (1.7%) participated in the study, too.

Experience and interests in the futures field was measured in the questionnaire in several ways. Half of the respondents (50.8%) classified themselves as futurists, which was more specifically defined in the questionnaire: futurist (for example consultant, professor or researcher in futures studies). The second biggest group were the researchers in areas other than futures studies (16.1%) and the third were professors in areas other than futures studies (14.4%). Among the respondents there were also business managers (5.1%), government officials (3.4%), journalists (1.7%) and trend analysts (0.8%). 7.6% of the respondents categorized themselves as "other" occupation (N=118).

The experience of the respondents in looking at the futures was considered to be a key question in evaluating the expertise of the respondents in the futures field. As mentioned above, the respondent who marked his/her experience to be none, was dropped from the analysis. Also, respondents who did not answer to the question of the experience in the futures field were dropped out from the statistical analysis. In general, the respondents had years of experience in the futures field. The majority of the respondents (45.8%, N=118) had over 15 years of experience in looking at the futures. 16.9% had 11-15 years of experience and the same percentage of respondents was valid for 6-10 years of experience. 15.3% had experience of 2-5 years, 5.1% had experience of less than 2 years.

The respondents were also asked to tell the maximum timescale that they are looking at the future. Majority of the respondents (36.4%, N=118) said that they look the maximum of 11-20 years ahead, 26.3% looked 21-50 years ahead in the future, 24.6% 6-10 years ahead in time, 6.8% more than 50 years ahead in the future, 5.9% 1-5 years ahead. None of the respondents looked less than one year to the future. These background results are shown as diagrams in Appendix 3.

For getting information about weak signals, the respondents were also asked to mark the areas of life from the seven possibilities which she/he is interested in and mark good sources of weak signals for those areas of life. The respondents were able to choose two areas of life of which changes they are interested in and then mark good sources for them from the list of alternatives. The reason why the respondents were not simply asked to mark good sources for weak signals was that there was a hypothesis that different sources of weak signals would be better for some areas of life than others. This appeared to be true, because the sources varied by the area of life, even though in some cases very slightly. The respondents (N= 229, all respondents had the possibility of answering twice, for priority 1 and priority 2 areas of life) followed the areas of life as indicated in Figure 2.

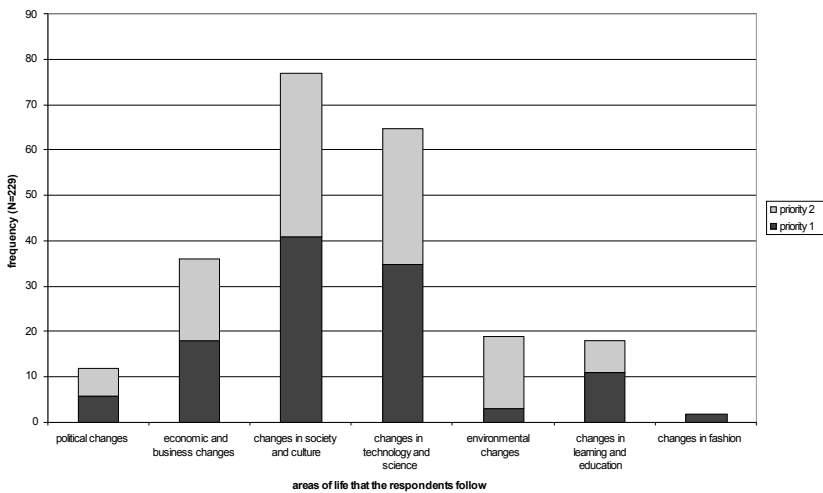


Figure 2. The areas of life of which changes the respondents followed. Dark grey in columns stands for priority 1 area, lighter grey for priority 2 area.

As Figure 2 illustrates, the respondents of this study followed the changes in culture and society the most. Technological changes were the second most followed area of life. Economic and business changes were the third. Environmental changes were ranked as the fourth most followed among the respondents. Changes in learning and education the fifth, and changes in politics the sixth. The researchers followed changes in fashion the least. Only two respondents marked that they follow this area of life. Because of the lack of respondents in this area, it was excluded from the analysis.

2.3.2 Results of the study: good sources of weak signals

Owing to the structure of the questionnaire it is not sensible to list the ranking of the good sources for weak signals as such, since the respondents marked these sources good for certain areas of life. However, based on the order of superiority of the good sources of weak signals in all of the areas of life it is possible to draw some conclusions which sources of weak signal in general are good and which are not. In this phase of the report it is more convenient to examine first the good sources of weak signals for looking changes at different areas of life.

In the study, the respondents were asked to mark out of seven alternative areas of life (political changes, economic and business changes, changes in society and culture, changes in technology and science, environmental changes, changes in learning and education, and changes in fashion) of which changes the respondent is most interested in (referred to as priority 1) and follows the most. The respondent were asked to mark *good* sources of weak signals in those areas out of a list of 36 sources (one of them being “other source”). The respondents were also asked to mark, which area of life they follow the second most (referred to as priority 2) and pick good weak signals for that from the list. In the results the frequencies both in priority 1 and priority 2 areas are added together. It would have been possible to use weighting coefficient for the frequencies because of their different priorities, but it is not used here. The reason for this is that there would not have been absolute/correct way to set the coefficients. It would have been totally random. That is why the weighting coefficients are excluded form the analysis.

The sources to the questionnaire were collected from various research (e.g. Webb

[6], Choo[34]) and some of the sources were added by the researcher of this study. For the purposes of the analysis, the sources were divided according to Choo’s [34: p.139] categorization which was discussed in section 1.1 (see also Appendix 2).

To see more detailed results, the sources of weak signals are divided according to the area of life which they were connected to by the respondents. These results are shown in Figures 3–8. They are also included in Appendix 4 in the form of tables.

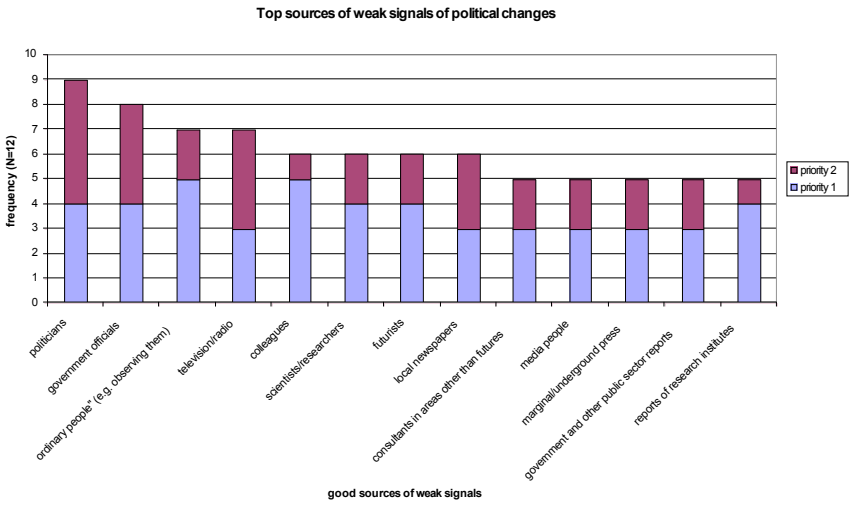


Figure 3. Top sources of weak signals of political changes. In the columns, the blue area indicates that politics was mentioned as priority 1 area of life, purple refers to priority 2 area of life. Total number of responses was 12.

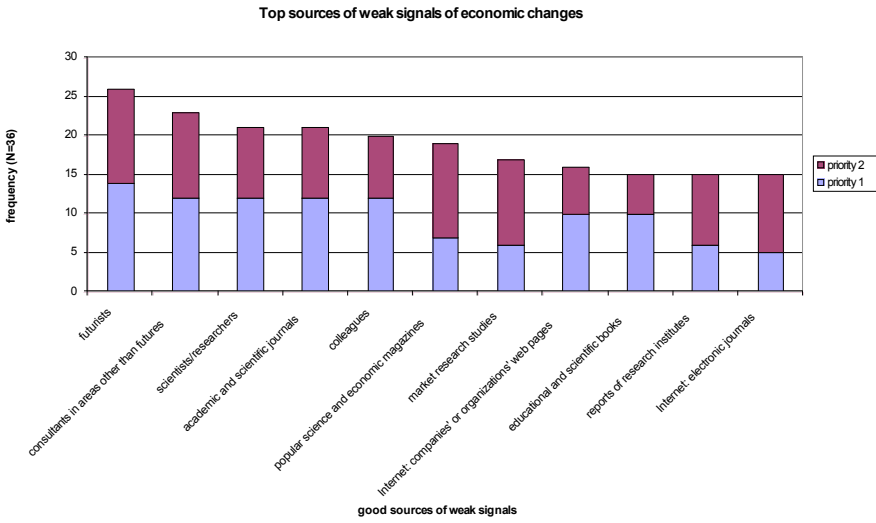


Figure 4. Top sources of weak signals of economic changes. Total number of responses was 36.

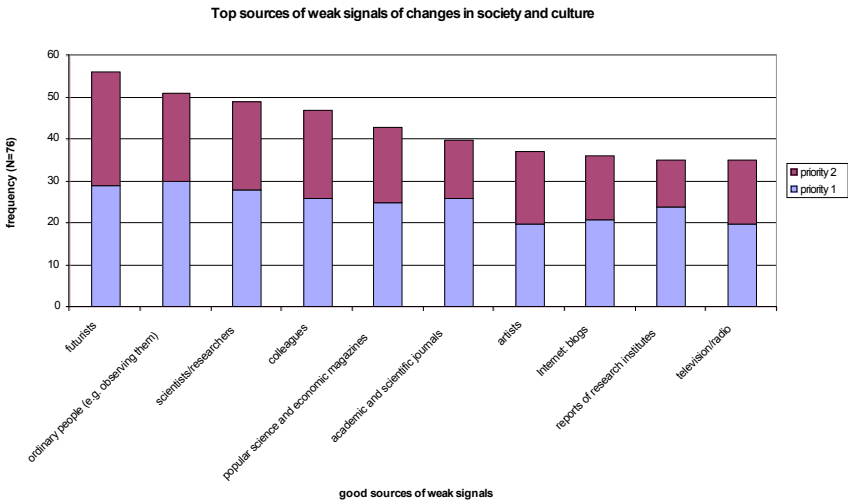


Figure 5. Top sources of weak signals of social and cultural changes. Total number of responses was 76.

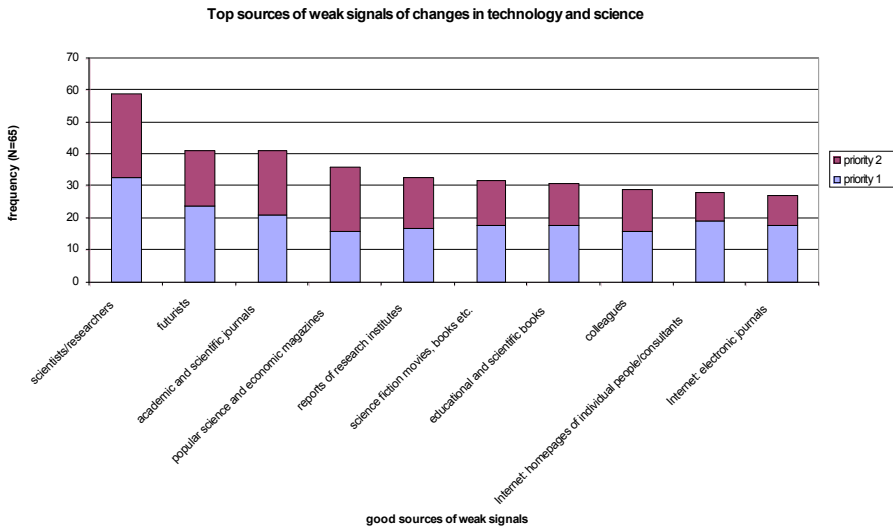


Figure 6. Top sources of weak signals of changes in technology and science. Total number of responses was 65.

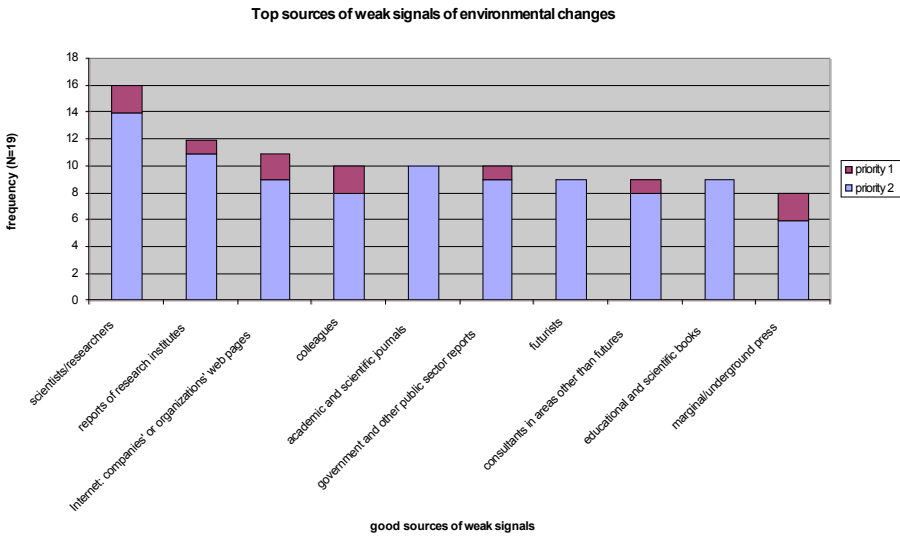


Figure 7. Top sources of weak signals of environmental changes. Total number of responses was 19.

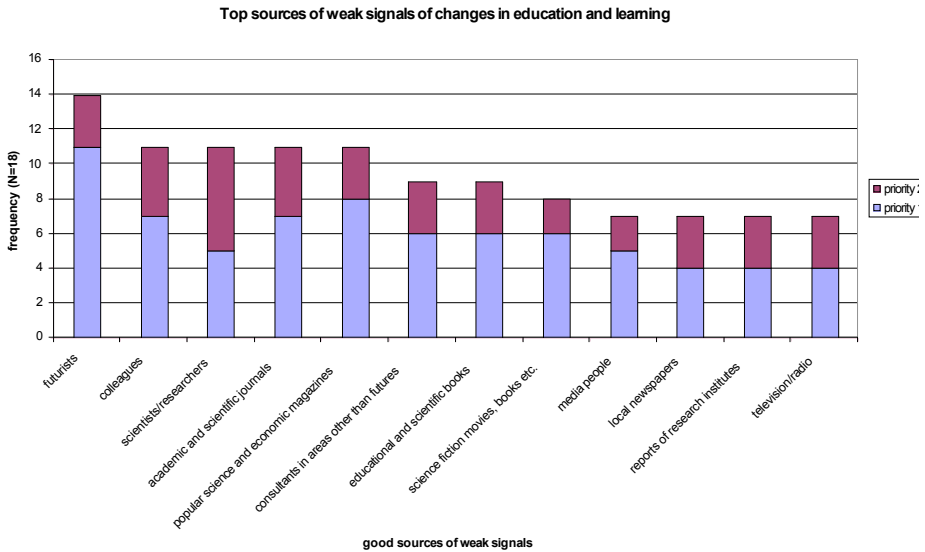


Figure 8. Top sources of weak signals of changes in education and learning. Total number of responses was 18.

It is possible to see from the Figures 3–8 that the sources that were considered good for finding weak signals somewhat varied by the area of life of which changes were looked for. Mostly, the top sources of weak signals were the same, but their order varied a little. However, there was an area of life, politics, which results differed from the others a lot. For example, the responses show that the respondents ranked politicians highest as a source of weak signals in political changes. In other areas of life, politicians were on the tag end of the list of good sources. Also, government officials were ranked high in the area of politics, while they were not considered to be top for finding weak signals in other areas. The ranking of the top sources of good weak signals in other areas of life was very uniform.

There were some sources that were at the top of the ranking in many areas of life. Scientists/researchers in universities or institutes, futurists (except in environmental changes), and academic and scientific journals (except in changes in society and culture) were usually ranked very high as a good source of weak signals.

It is not possible to draw conclusions from the total frequencies of good sources, because the number of the respondents varied by the area of life in question.

However, it is possible to rank the sources by combining the rankings of sources in all areas of life. Table 2 shows the order of superiority of the sources for weak signals calculated in this way.

Table 2. The order of superiority of the sources of weak signals in all areas of life.

number of order	A good source of weak signals
1	scientists/researchers
2	futurists
3	colleagues
4	academic and scientific journals
5	reports of research institutes
6	consultants in areas other than futures
7	popular science and economic magazines
8	television/radio
9	educational and scientific books
10	Internet: companies' or organizations' web pages
11	ordinary people (e.g. observing them)
12	media people
13	Internet: electronic journals
13	Internet: homepages of individual people/consultants
15	email newsletters
16	science fiction movies, books etc.
17	government and other public sector reports
17	Internet: discussion groups
19	Internet: blogs
20	marginal/underground press
21	periodicals
22	local newspapers
23	Internet: electronic databases
24	government officials

25	email lists
26	movies
27	artists
28	market research studies
29	politicians
29	annual reports of companies
31	family/friends
32	patents
33	doctoral dissertations
34	proposals for laws
35	other source?
36	art exhibitions

From the above table, it is possible to see that the top ten sources of weak signals included many human sources, such as scientists, futurists, colleagues and consultants. Three most appreciated sources belonged to the category human sources. This supports the earlier findings of other researchers that personal network is important for finding information (see section 1.2). Textual sources like academic and scientific journals, research institute reports, popular science and economic magazines, television/radio, and educational and scientific books were also appreciated. Of the online sources company and organization websites were the only ones to appear in the top ten. However, two more appeared in the top fifteen sources. Blogs, the importance of which Day and Schoemaker [45: p. 58-59] emphasized, were ranked no more than 19/36 (the figures refer to the ranking in list of 36 sources in this study). Obviously, futurists have not found these sources of weak signals yet.

When comparing these results to the “information life cycle” by Choo [44] in Figure 1, it is interesting to see that the respondents did not have a tendency to use the sources, listed in the “idea creation” phase, from which weak signals can be found. Sources in the idea creation phase included, for example, artistic works (rankings in this study: 27/36, 36/36), science fiction (16/36), fringe and alternative press (20/36), academic and scientific journals (4/36), patent applications

(32/36) and doctoral dissertations (33/36). As can be seen from these sources, except for academic and scientific journals, the respondents did not much appreciate them as good sources for weak signals. On the other hand, sources mentioned in “elite awareness phase,” in which sources of weak signals can also be found, were ranked higher as good sources of weak signals (reports of research institutes 5/36, popular science and economic magazines 7/36). However, it is important to notice that Choo’s information lifecycle includes only textual sources.

2.3.3 Use of human, textual and online sources in finding weak signals from different areas of life

Choo’s [34: p.139] division of sources to human, textual and online sources is used here to compare where good sources of weak signals are found for different areas of life. The division of all the sources (except for “other source”) is listed in Appendix 2. The results of good categories of sources of weak signals in different areas of life are calculated and the average frequencies of source categories in different areas of life are compared. Results are presented in Figure 9.

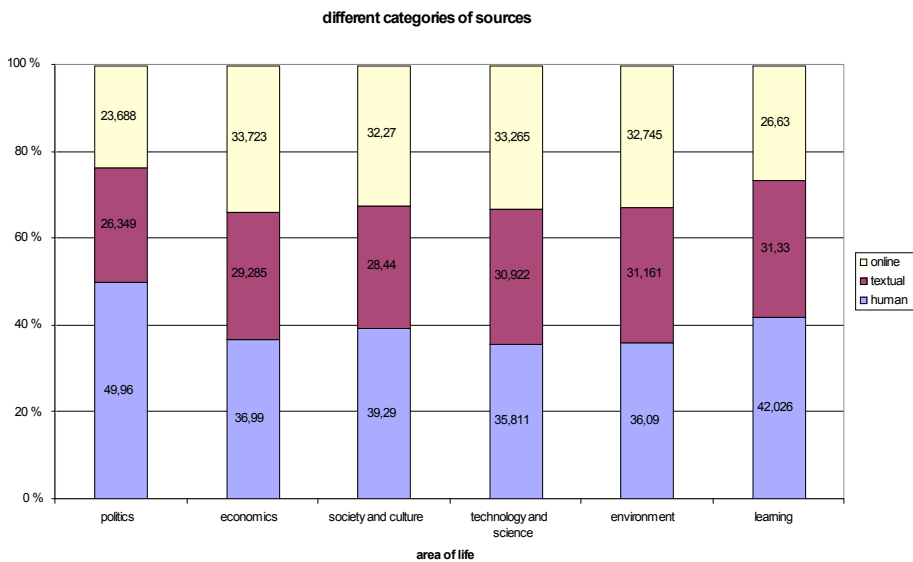


Figure 9. Good sources of weak signals by categories in different areas of life.

In politics, society and culture, and learning and education human sources were appreciated notably more than in other areas of life. Textual sources were appreciated almost equally in all areas of life. Online sources were least appreciated in the field of politics and education and learning. As a summary, there were no big differences in the categories (human, textual and online) the sources of which are considered good for finding weak signals from different areas of life. The sources for political changes, again, seemed to differ slightly. However, it is important here to see the limitations of this analysis: the overlapping of the sources (for example, futurists and colleagues are sometimes the same) change the results from what is seen in Figure 9. This is why the results should only be taken as suggestive.

2.3.4 Characteristics of good sources of weak signals

In the questionnaire, the respondents were asked to mark which sources of weak signals they consider the best or second best in the area of life which they follow. The respondents were also asked to describe why they consider some sources better than others. In this way, it is possible to get answers to the question of what features good sources of weak signal have. Although nearly all sources were mentioned by the respondents, the features they mentioned for the top ten sources are gone through in this section. In addition, some comments of selected interesting sources are gone through. All in all, the respondents mentioned that good sources are usually the people who create changes (e.g. scientists, artists, fringe) or monitor changes for their living (e.g. futurists, consultants). Also, sources that report about the people creating changes and the changes themselves in their early phase are good for finding weak signals.

Scientists as a source of weak signals were highly valued among the respondents. The reasons for scientists' being considered as good sources included claims such as that they are creating the future, they work with long term perspective ("In some cases scientists develop solutions that are applied after delay of 10-30 years") and cutting-edge innovations. They were also considered to be leading-edge thinkers and they were considered to spread the word around if they come up with an innovation. In the same way as scientists, futurists were considered to be forward-looking. Their value as a good sources of weak signals in the respondents is based on their tendency

to look toward the future. Futurists are naturally searching for clues and cues to alternative futures and they were considered to be anxious to be the first to see signs of change. They were also thought to scan unexpected areas.

With another highly appreciated source of good weak signals, colleagues, there was some overlapping especially in terms of futurists as a source. Because of the background of the respondents it is presumable that their colleagues might well be futurists. This can even more raise the ranking of futurists as a source. The respondents evaluated colleagues as a good source of weak signals because of the possibility to have discussions and dialogue with them and share experiences. They were also considered to give hints about weak signals from different areas of life. Also, the wisdom of well-educated crowds was mentioned.

Consultants in areas other than futures were considered to be good sources of weak signals because they, for example, know what is going on in specific fields. Also, they were considered to have a need to track down changes in order to survive, that is, to make a good impression on their markets and clients.

Academic and scientific journals were a top textual source of weak signals mentioned by the respondents. Comments on this source included, for example, that that they scan alternative futures early in development, they contain announcements of fundamental results, and in these kinds of sources intelligent people are organizing their ideas. One respondent specified that weak signals can be identified within articles as footnotes, etc. The other highly ranked textual source for weak signals were the reports of research institutes. The respondents appreciated their focus on innovation and early knowledge of potential applications.

Also popular science and economic magazines were favored by the respondents as good sources for information. Respondents commented for example that an article in this kind of periodical will be more than just about a small fad. They were considered to point out events that might trigger changes. These magazines were considered to contain small stories of emerging issues and inform about latest ideas, because journalists were thought to have a desire to tell something new. The easiness of these sources was appreciated. One respondent commented that they

are easy to understand for laymen. Another respondent commented that they include vast material and one has time to read lots of them in airports.

Television and radio were ranked high as good sources of weak signal. Among the reasons for this was the impact that they have on people. According to one respondent, the signals that are reported in television and radio channels were considered to have an impact on people's attitudes and behavior. Also, the variety of material that television, especially cable TV, provides was considered as an advantage of this source, also public radio and television were considered as good sources of radical thinking.

Educational and scientific books also ranked high as good sources of weak signals. The respondents gave some comments about these sources: they provide an overview of long-term trends, have a vested interest in tracking and anticipating technological breakthroughs, and also in explaining letdowns. They were also considered to be research-oriented.

The only online source in the top ten were the organization and company websites which were mentioned to be good because, for example, many projects, undertakings and initiatives can be found there. In addition, they are easy and quick, and they usually point to other important links or articles.

A source worth mentioning is observing ordinary people (11/36). Reasons for this source being useful in hunting weak signals according to the respondents was for example that trends stem bottom-up. Also, things people do are more valuable than what they say. Ordinary people were also considered to reflect reality. One of the respondents pointed out that "most of the answers are not in books, newspapers or major reports but in the cue of a bus stop, or in a bar, or at a campus." Young and fringe groups and early adapters were mentioned as interesting groups to follow.

The sources discussed above represents the top ranking of the sources of weak signals in this study. However, there are some interesting other sources that were appreciated, even though not as much. I go through some comments about the following sources because they were mentioned in the literature as sources of weak

signals: blogs, marginal and underground press, science fiction, artists, patents and local newspapers. Comments about artists included that they feel the future signals very sensitively. They were also considered to be less constrained by conventions than business and ordinary people. They were also mentioned to have the ability to signal trends at their early stages which others then take up. Pros of science fiction, according to the respondents, were its originality, innovativeness and thought-provoking nature. Sci-fi writers were said to do a lot of preliminary work for the output and put the ideas within the everyday context. One respondent commented: "If you want fair estimation of what might be, read science fiction as the authors are not constrained by reality." Patents were naturally valued more as sources of weak signals of technological changes. One respondent commented why she/he considered patents as a very good source of weak signals: "The next 'big thing' was always invented over 25 years ago."

Local newspapers were used by John Naisbitt in his search for the understanding of megatrends. According to the respondents, their value in finding weak signals was due to their being comprehensive and covering a wide area. Besides reporting news, they also tell about strange small events. One respondent commented that most grassroots movements start locally and are reflected in local news papers pretty soon. Marginal and underground press was valued because they were considered to state issues that have not yet become general or public knowledge, they were considered to be "breeding ground" for major trends in society and culture, and they probe beneath the surface of everyday life. Also, the fact was mentioned that they publish information that the mainstream press does not.

Blogs are a favorite source for finding weak signals for me as a weak signal "hunter". Blogs were also valued by some of the respondents as best or second best source for weak signals. Reasons for that, according to the respondents' comments, were for example that the insider status and the competition between bloggers drive detection of weak signals. Bloggers were also seen to be keen on looking for special or strange ideas and sharing them, as well as to speak about the changes openly. One respondent commented that "if you find the right We-blogs you are peeking over the shoulder of the researcher as they think about their research." Another respondent wrote that blogs are immediate while books and

journals delay the signal's transmission because of the timeline of publication.

2.3.5 Features of good sources of weak signals in general

Even though the questionnaire was mainly quantitative, the respondents also had the opportunity to write comments about weak signals freely. In question 20, the respondents were asked to comment on good sources of weak signals. The respondents wrote as many as eighty valuable comments.

Certain things in the respondents' answers stuck out. Some respondents emphasized the need for interaction, openness and discussion in finding weak signals. Also, working with different kinds of people was considered to be an asset in search for weak signals. There were comments, which made it clear that weak signals are not sought from a single source, but many. One has to look for various sources with wide coverage and preferably in different areas of life. Combining information from many sources is important. One good way to find weak signals is to scan the scanners as one respondent commented (futurist can be considered as scanners). More generally, keeping eyes open, having sensitivity to changes, creativity, receptiveness, intuition, and a curious mind is needed in order to find weak signals of change.

Some of the respondents emphasized that it is not the sources of weak signals that are important, but rather the process of how to process them. Cross-mapping signals was mentioned as one tool for understanding changes. On a personal level, the sense-making process of weak signals has much to do with scanning the changes, using intuition and feelings and interacting with other people.

There were also some sources that were not mentioned in the questionnaire but some of the respondent wrote in their answers: extremes, life itself, school children, conferences and traveling are among some of the mentioned sources.

2.3.6 The effect of different background factors of the respondents on the use of different sources of weak signals

The huge amount of research data gained from this research would have enabled an examination of the correlations and dependencies of a number of characteristics. However, only some cross-dependencies are examined in this report – name-

ly, those that appeared to be the most interesting to the researcher. An interesting question is weather the types of weak signal sources that were evaluated as *the best* (priority 1 + priority 2 areas of life) were dependent on certain background characteristics of the respondents, such as their experience in the field of the futures, their gender or their dwelling place (continent)? Tables 3-5 show the frequencies of these settings.

Table 3. Frequencies of the best source for weak signals (categorized by type of source) and the experience of the respondents in the futures field.

<i>experience</i>	<i>source type</i>		
	<i>human</i>	<i>textual</i>	<i>online</i>
under 2 years	7	3	0
2-5 years	17	11	5
6-10 years	21	8	7
11-15 years	14	13	7
over 15	55	24	20

For analyzing the interdependencies in this case with χ^2 test, classes under 2 and 2-5 years were combined. The χ^2 test gives result 5.12 (f=6), which is smaller than critical value of χ^2 (5%, f=6) 12.6. This means that H0 is true, which means that experience in futures field does not correlate with evaluating a certain kind of source (human, textual or online) of weak signal as the best one.

Table 4. Frequencies of the best source of weak signals (categorized by the source type) and the gender of the respondents.

<i>gender</i>	<i>source type</i>		
	<i>human</i>	<i>textual</i>	<i>online</i>
female	32	13	10
male	75	45	29

The χ^2 test gives result 1.1 (f=2), which is smaller than critical value of χ^2 (5%, f=2) 5.99. Again, H0 is true here, which means that gender does not correlate

with evaluating a certain kind of source (human, textual, online) of weak signals as the best.

Table 5. The area where the respondents live and evaluation of sources of weak signals (the best source) by categories. Asia, Africa and Australia and Oceania are combined in one category, because of the lack of respondents from these areas.

area	type of source		
	human	textual	online
Afr/Asia/Aus	17	6	1
Europe	45	29	19
America	47	23	23

The χ^2 test gives result 6.62 ($f=4$), which is smaller than critical value of χ^2 (5%, $f=4$) 9.488. Again, H_0 is true, which means that area that the respondents live does not correlate with evaluating a certain kind of source (human, textual, online) of weak signal as the best.

From the above results, the conclusion can be drawn that neither the experience in futures field, gender nor the area where the respondent live had no effect on the type of sources of weak signals which the respondents ranked as best source. It is important to notice here that the effect of various areas of life has not been taken into account in these calculations. These results include limitations because of the dilemma of random sampling. That is why these results should be taken as suggestive, not absolute.

2.4 Limitations and critique of the study

As in all studies, there were some challenges and limitations in this study, too. In making a questionnaire, there is always the dilemma of balancing with the length of the questionnaire in order to make sure that respondents have the energy to an-

swer as many questions as possible and to get as much results as possible from the questionnaire. In this research, there appeared an amazing opportunity to gather information from futurists and future-oriented people globally – thanks to many friendly people who helped to spread the invitation to participate the research. This encouraged the researcher to make the questionnaire slightly longer than the original idea was, which enabled receiving more material from this unique group of respondents. It should be pointed out, however, that not a single question in the questionnaire was compulsory to answer. The length affected the feedback, and some of the respondents considered too long and “mechanistics”. However, there were opposite views, too: someone commented that the questionnaire was short and to the point.

Even though the questionnaire was tested in Finland Futures Research Centre and on the basis of that some adjustments were made, there were some elements in the questionnaire that appeared to be too complex, demanding and/or frustrating from the point of view of the respondents. For example, some of the questions, such as asking the best and the second best source for weak signals, were quite repetitive. It was also problematic that the sources overlapped. For example, colleagues, one of the sources that was highly valued, can in many case be futurists who were another source in the list. This overlapping of the sources can affect the results of the analysis. Overlapping was unavoidable, but I think that in these cases the respondents indicated both as good sources of weak signals.

An issue that was raised by some of the respondents was that looking at the sources of weak signals is not essential, it is more the process that counts. The importance of the process of dealing with weak signals is highly valued by me, but the aim of this study was more to focus on the sources. Why the quantitative study of sources of weak signals? There are four reasons for that. Firstly, the previous study of mine raised an interest in finding out sources that the futurists consider good for finding weak signals. Secondly, the wide international group of respondents, for whom the study was aimed at, made it tempting to accomplish a quantitative study, because, from quantitative perspective, the large number of respondents would give statistically more valuable results. Thirdly, the convenient Internet software used in this study preferred quantitative study. However, the

software also allowed qualitative open questions, which were also included in the study. Fourthly, the information on the kind of sources the futures experts consider good sources for weak signals could be utilized in organizations when they are planning environmental scanning procedures.

The most critical issue in this study is the sampling and generalization of results. Statistical methods were used in this study to calculate the interrelationship of certain factors (see section 2.3.6). Using statistical methods means the possibility to make overall generalizations of the target population, which in this case is all futurists and future-oriented people in the world, on the basis of the results. Prerequisite for using statistical methods is random sampling from the overall population. I see that in this study random sampling from the overall population of the futurists would be quite impossible, because there exists no list of all futurists in the world (at least, not that I know about it). Also, it was revealed for me that getting contact to many futurists was difficult because of the problems in finding their contact information. Thus, the results gained by statistical analysis should be considered more as suggestive, not absolute, because of the problems in sampling and generalization connected to the study. However, if it would be assumable that the respondent population of the study represents the overall population of futurists, these results can be considered more generalizable.

3 CONCLUSIONS AND DISCUSSION

This study aimed to answer some question concerning sources of weak signals. The research questions of this study were presented in the section 2. The first two research question concerned the sources that futurists and futures-oriented people consider good for finding weak signals and what sources are considered good for different areas of life. It appeared from the international study that there are some differences in sources that are considered good for different areas of life. Some sources were considered in top ten sources for certain areas of life, whereas for other areas the same sources could be among the last ones. For example politicians were appreciated as top sources on the subject of political changes, in the same way as patents were top sources as regards technological changes. In oth-

er areas of life these sources were not appreciated as much. However, there were some sources that were considered good for many areas of life. Among these were scientists, futurists and colleagues, academic and scientific journals, reports of research institutes. The top ten of appreciated sources basically resembled, with few exceptions, the FFRC respondents' list. The most surprising finding of this study was that various sources of the Internet were not highly appreciated among the respondents.

Two research questions focused on finding answers to whether some categories of sources are more appreciated in finding weak signals than others. Also, the intention was to find an answer to the question of whether certain background factors of the respondents have an effect on the use of certain types of sources. It appeared that all source categories (human, textual and online) were appreciated almost equally by the respondents of the international study. Human sources were, however, the most appreciated in all categories. The background factors like gender, dwelling place (continent) and experience in futures field did not seem to affect the appreciation of source categories. However, because of the lack of random sampling and difficulty of defining the overall population, these results should only be taken as suggestive.

The results have some implications for organizations which are planning or modifying their environmental scanning procedures. For getting a good overview of where the world is going, there are certainly some sources that should be added to the scanning list according to the results of this study. Futurists are the ones whose purpose is to look for the changes in the world. As one of the respondents commented, scanning the scanners is a good way to find weak signals. People who are making the future, such as scientists, artists, lead users and fringe, are good sources to keep track of, as well as the sources that document their actions like popular science journals and marginal press. I personally recommend to scan the Internet, especially the blogs, even though they were not highly appreciated in this study. The blogs provide a way to see what people are really doing and thinking. The future, as we know, is very much dependent on actions of ordinary people. All in all, interaction, openness, sensitivity to changes, creativity and discussion are also needed when seeking for weak signals of change.

APPENDIX 1.

The forewords to the questionnaire (including a definition of weak signals) and structure of the questionnaire

Forewords in the study:

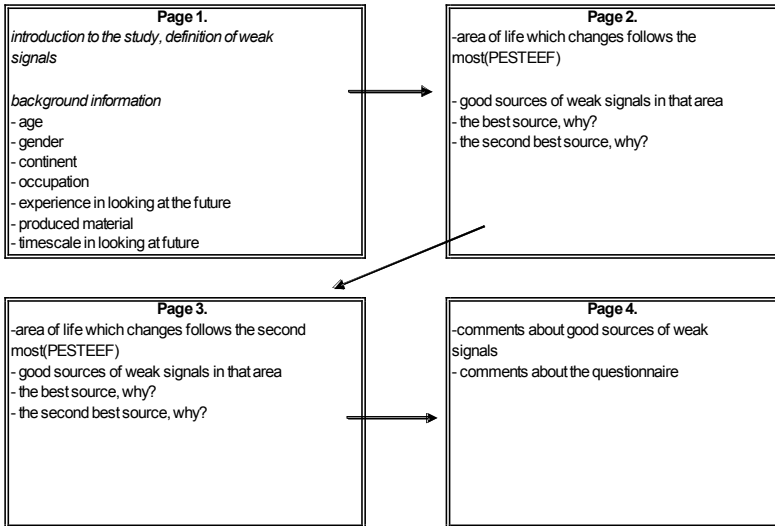
Study about sources of information on future

This is a global study about information sources of weak signals for futures professionals and people interested in the future in general. The aim of this study is to find out where futures professionals and future-oriented people collect information that can foretell changes in the future (i.e. weak signals). The study is conducted by Ms. Elina Hiltunen from Finland Futures Research Centre as a part of her Ph.D. thesis. The results of the study will be available for all participants on request by email: elina.hiltunen@tse.fi. Your participation in the study is highly appreciated!

Definition of weak signals:

In this study, weak signals mean today's information that can foretell the changes in the future. This information might sound funny or strange and it can cause confusion, because it offers a totally new way of thinking/ideal/innovation. As time passes, it might come out that weak signals were the first signs or symptoms of a big change, even megatrends. However, weak signals are not always clues about big changes. They might simply be information about strange things that have happened. A practical example of weak signals is an article about some new technical innovation in a magazine

The logic of the questionnaire in this study



The structure of the questionnaire in this study (including the questions)

APPENDIX 2.

Categorization of the sources

The sources were divided into three categories: human, textual and online sources. More precisely the following sources belonged to these three categories:

Human sources:

- colleagues
- scientist/researchers in universities or institutes
- futurists
- consultants in areas other than futures
- politicians
- government officials
- media people
- artists
- family/friends
- "ordinary people" (e.g. observing them)

Textual sources:

- educational and scientific books
- academic and scientific journals
- popular science and economic magazines and papers
- periodicals, which?
- marginal/underground press
- local newspapers
- doctoral dissertations
- patents
- government and other public sector reports
- annual reports of companies
- reports of research institutes
- proposals for laws
- market research studies
- television/radio
- movies

- art exhibitions
- science fiction movies, books, etc.

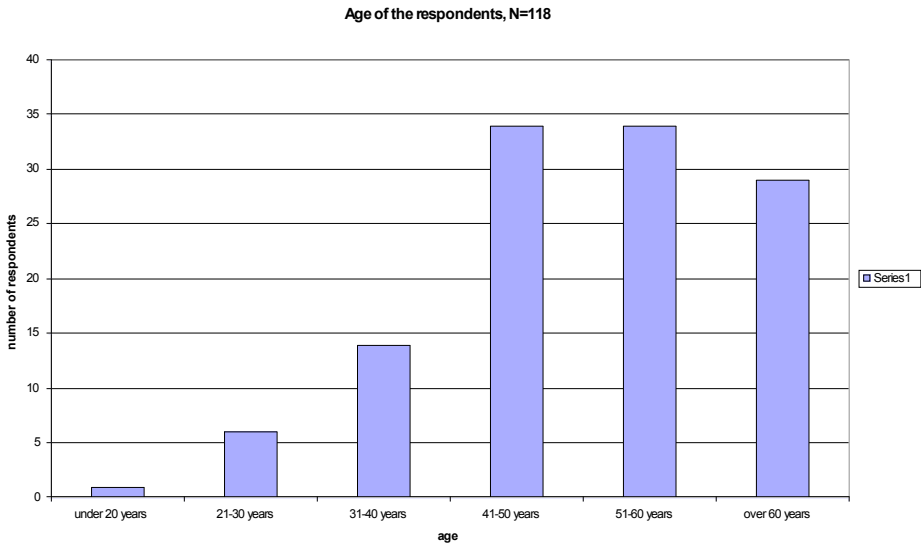
Online sources

- Internet: company or organization websites
- Internet: homepages of individual people/consultants
- Internet: electric databases
- Internet: electric journals
- Internet: blogs
- Internet: discussion groups
- email newsletters
- email lists

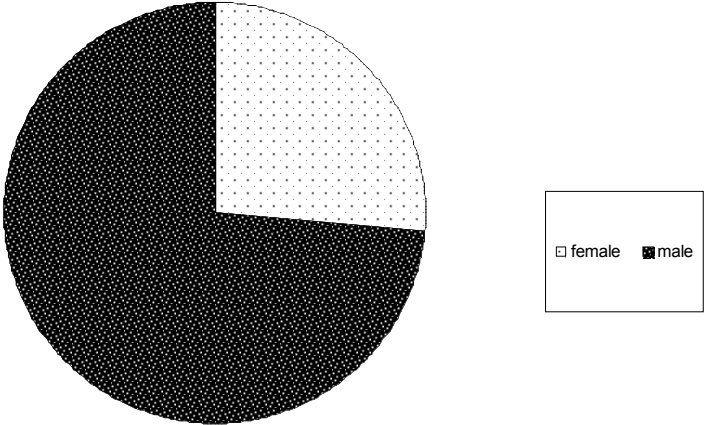
APPENDIX 3.

Background information of the respondents as diagrams.

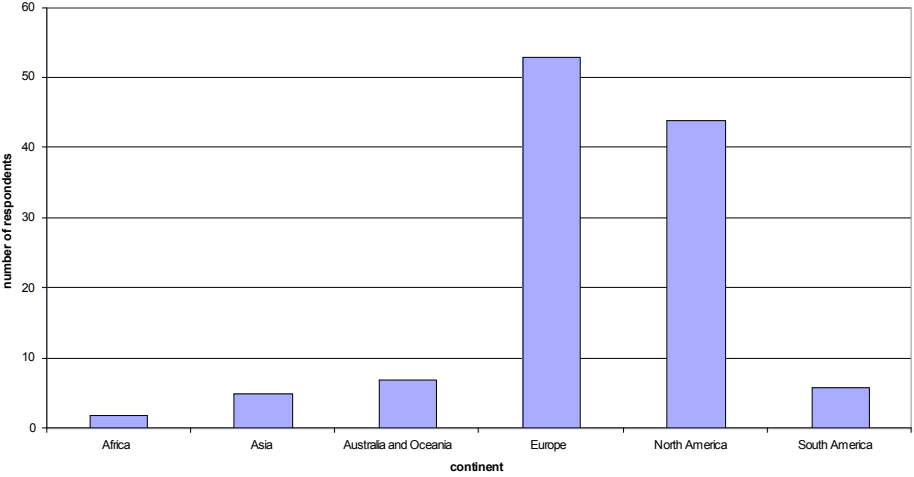
In these diagrams of background information the person's background information that marked to have none experience in looking at the futures is excluded in all other figures except for the one that describes the experience in the futures field.



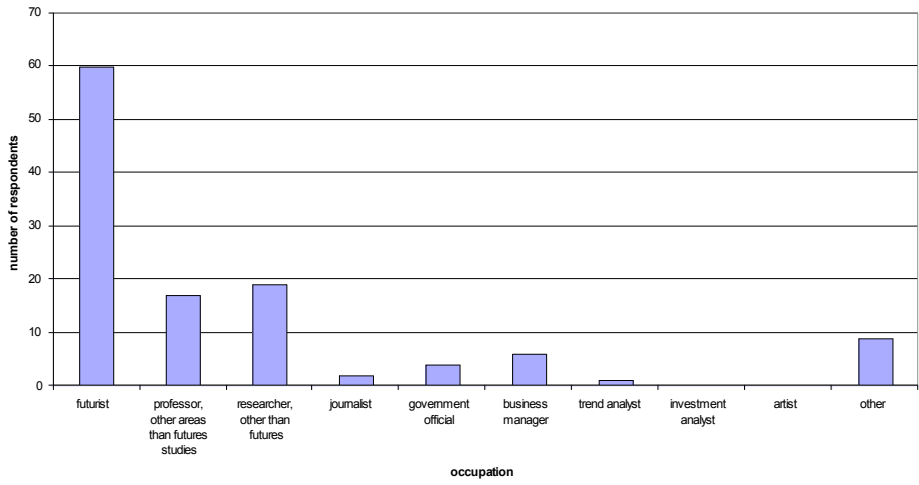
Gender N=114



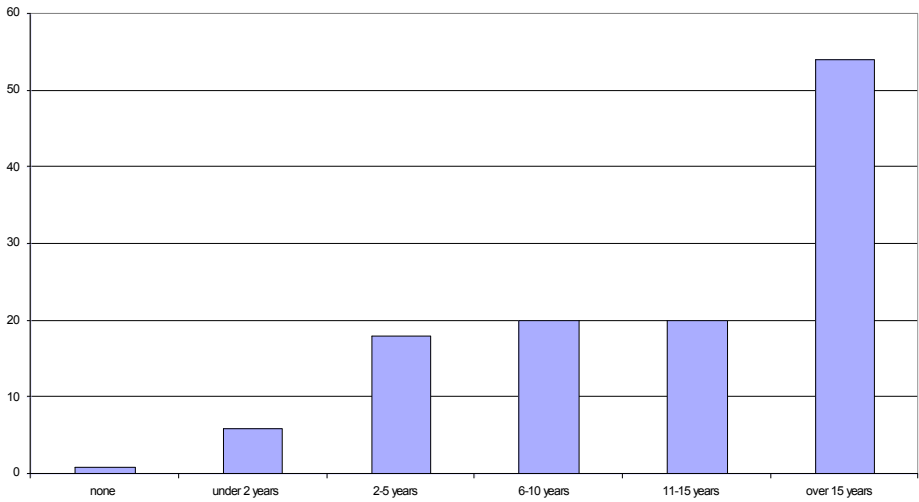
Continent (N=118)



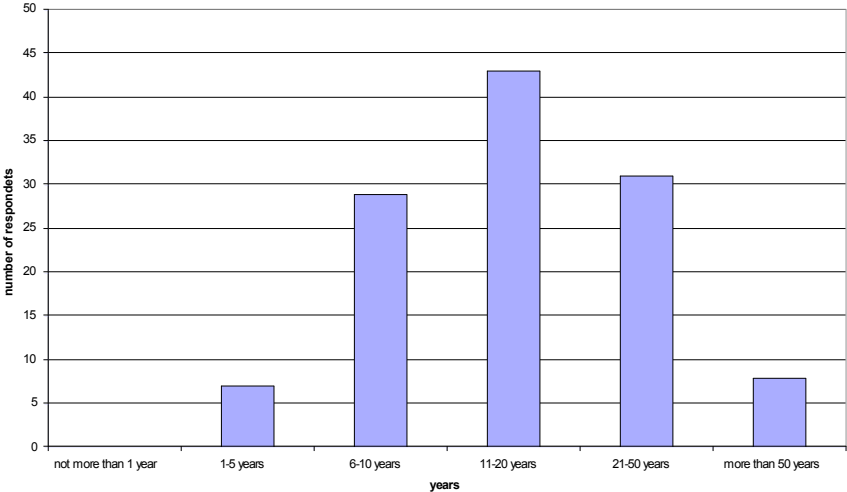
Occupation (N=118)



Experience in "looking at the futures" (N=119)



APPENDIX 3.



APPENDIX 4.

List of good sources by the area of life from which changes were looked for.

Table 1. Good sources of weak signals for changes in politics (N=12). Priority 1 refers to respondents that have selected to follow political changes the most, priority 2 refers to people looking for political changes the second most.

sources for politics	priority 1	priority 2	yhteensä
politicians	4	5	9
government officials	4	4	8
ordinary people (e.g. observing them)	5	2	7
television/radio	3	4	7
colleagues	5	1	6
scientists/researchers	4	2	6
futurists	4	2	6
local newspapers	3	3	6
consultants in areas other than futures	3	2	5
media people	3	2	5
marginal/underground press	3	2	5
government and other public sector reports	3	2	5
reports of research institutes	4	1	5
family/friends	2	2	4
academic and scientific journals	4	0	4
Internet: electronic databases	4	0	4
Internet: electronic journals	4	0	4
educational and scientific books	3	0	3
proposals for laws	2	1	3
email newsletters	3	0	3
email lists	3	0	3
artists	2	0	2
popular science and economic magazines	2	0	2
periodicals	1	1	2
patents	2	0	2
annual reports of companies	1	1	2
movies	1	1	2
Internet: companies' or organizations' web pages	2	0	2
Internet: homepages of individual people/consultants	2	0	2
Internet: blogs	1	1	2
Internet: discussion groups	2	0	2
other source?	2	0	2
doctoral dissertations	1	0	1
market research studies	1	0	1
art exhibitions	0	1	1
science fiction movies, books etc.	0	1	1

Table 2. *Good sources of weak signals for changes in economics (N=36).*

sources for economics	priority 1	priority 2	altogether
futurists	14	12	26
consultants in areas other than futures	12	11	23
scientists/researchers	12	9	21
academic and scientific journals	12	9	21
colleagues	12	8	20
popular science and economic magazines	7	12	19
market research studies	6	11	17
Internet: companies' or organizations' web pages	10	6	16
educational and scientific books	10	5	15
reports of research institutes	6	9	15
Internet: electronic journals	5	10	15
television/ radio	8	6	14
periodicals	5	8	13
Internet: blogs	6	7	13
Internet: discussion groups	8	5	13
ordinary people" (e.g. observing them)	9	3	12
Internet: homepages of individual people/consultants	7	5	12
Internet: electronic databases	4	8	12
media people	6	5	11
government and other public sector reports	5	5	10
email newsletters	4	5	9
marginal/underground press	5	2	7
local newspapers	4	3	7
annual reports of companies	2	5	7
movies	6	1	7
science fiction movies, books etc.	6	1	7
email lists	4	3	7
government officials	3	3	6
artists	5	1	6
doctoral dissertations	4	2	6
proposals for laws	2	4	6
politicians	2	3	5
patents	2	2	4
art exhibitions	4	0	4
other source?	3	1	4
family/friends	3	0	3

Table 3. *Good sources of weak signals for changes in society and culture (N=76).*

sources for society and culture	priority 1	priority 2	altogether
futurists	29	27	56
ordinary people (e.g. observing them)	30	21	51
scientists/researchers	28	21	49
colleagues	26	21	47
popular science and economic magazines	25	18	43
academic and scientific journals	26	14	40
artists	20	17	37
Internet: blogs	21	15	36
reports of research institutes	24	11	35
television/radio	20	15	35
Internet: discussion groups	17	17	34
consultants in areas other than futures	19	14	33
movies	18	15	33
science fiction movies, books etc.	26	7	33
email newsletters	21	12	33
marginal/underground press	21	11	32
media people	17	12	29
Internet: companies' or organizations' web pages	15	14	29
periodicals	19	9	28
Internet: electronic journals	18	10	28
Internet: homepages of individual people/consultants	13	14	27
family/friends	13	12	25
market research studies	14	11	25
art exhibitions	13	12	25
educational and scientific books	16	7	23
local newspapers	16	7	23
Internet: electronic databases	13	9	22
government and other public sector reports	14	5	19
email lists	11	8	19
other source?	9	6	15
politicians	5	6	11
patents	9	1	10
government officials	5	4	9
proposals for laws	7	2	9
doctoral dissertations	4	3	7
annual reports of companies	6	1	7

*Table 4. Good sources of weak signals for changes in technology and science
(N=65)*

sources for technology and science	priority 1	priority 2	altogether
scientists/researchers	33	26	59
futurists	24	17	41
academic and scientific journals	21	20	41
popular science and economic magazines	16	20	36
reports of research institutes	17	16	33
science fiction movies, books etc.	18	14	32
educational and scientific books	18	13	31
colleagues	16	13	29
Internet: homepages of individual people/consultants	19	9	28
Internet: electronic journals	18	9	27
consultants in areas other than futures	13	13	26
patents	10	12	22
Internet: blogs	14	6	20
email newsletters	12	8	20
doctoral dissertations	13	6	19
Internet: companies' or organizations' web pages	12	7	19
periodicals	7	11	18
media people	9	8	17
government and other public sector reports	9	8	17
television/ radio	12	5	17
email lists	12	5	17
market research studies	12	4	16
Internet: electronic databases	10	6	16
Internet: discussion groups	11	4	15
government officials	7	7	14
artists	7	5	12
ordinary people (e.g. observing them)	5	5	10
annual reports of companies	4	5	9
movies	4	5	9
other source?	3	5	8
family/friends	2	5	7
marginal/underground press	4	3	7
local newspapers	3	3	6
art exhibitions	2	2	4
politicians	1	2	3
proposals for laws	1	2	3

Table 5. *Good sources of weak signals for changes in the environment (N=19)*

sources for environment	priority 2	priority 1	altogether
scientists/researchers	14	2	16
reports of research institutes	11	1	12
Internet: companies' or organizations' web pages	9	2	11
colleagues	8	2	10
academic and scientific journals	10	0	10
government and other public sector reports	9	1	10
futurists	9	0	9
consultants in areas other than futures	8	1	9
educational and scientific books	9	0	9
marginal/underground press	6	2	8
popular science and economic magazines	6	1	7
Internet: homepages of individual people/consultant	7	0	7
email lists	7	0	7
television/radio	5	1	6
annual reports of companies	5	0	5
science fiction movies, books etc.	4	1	5
Internet: electric journals	5	0	5
Internet: discussion groups	5	0	5
email newsletters	4	1	5
media people	4	0	4
ordinary people (e.g. observing them)	3	1	4
local newspapers	3	1	4
politicians	3	0	3
government officials	3	0	3
family/friends	3	0	3
periodicals	2	1	3
proposals for laws	3	0	3
movies	3	0	3
Internet: electronic databases	2	1	3
other source?	3	0	3
doctoral dissertations	1	1	2
art exhibitions	2	0	2
Internet: blogs	1	1	2
artists	1	0	1
patents	1	0	1
market research studies	1	0	1

Table 6 *Good sources of weak signals for changes in education and learning*
(*N=18*).

sources for education and learning	priority 1	priority 2	altogether
futurists	11	3	14
colleagues	7	4	11
scientists/researchers	5	6	11
academic and scientific journals	7	4	11
popular science and economic magazines	8	3	11
consultants in areas other than futures	6	3	9
educational and scientific books	6	3	9
science fiction movies, books etc.	6	2	8
media people	5	2	7
local newspapers	4	3	7
reports of research institutes	4	3	7
television/radio	4	3	7
periodicals	3	3	6
Internet: companies' or organizations' web pages	3	3	6
Internet: homepages of individual people/consultants	3	3	6
government officials	2	3	5
ordinary people (e.g. observing them)	5	0	5
Internet: electronic databases	2	3	5
Internet: blogs	3	2	5
Internet: discussion groups	3	2	5
email newsletters	3	2	5
artists	2	2	4
marginal/underground press	2	2	4
government and other public sector reports	3	1	4
movies	3	1	4
politicians	2	1	3
doctoral dissertations	2	1	3
annual reports of companies	2	1	3
market research studies	2	1	3
Internet: electronic journals	1	2	3
family/friends	2	0	2
art exhibitions	1	1	2
patents	1	0	1
email lists	1	0	1
other source?		1	1
proposals for laws	0	0	0

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WHERE DO FUTURE-ORIENTED PEOPLE FIND WEAK SIGNALS?

This study focused on the sources of weak signals in anticipating future changes. The main research question of this study was: *Where do future oriented people find weak signals about forthcoming changes?* The target groups of the study were futurists and future-oriented people.

The study was completed in two phases. First, a small pilot study was accomplished at Finland Futures Research Centre (FFRC) mainly to test the functionality of the questionnaire. The primary international research was done in spring 2007.

The results of these studies show that ranking of good sources of weak signals varied according to the area of life. The top five of good sources of weak signals (all areas of life included in order of superiority) in the international study were: scientist/researchers, futurists, colleagues, academic and scientific journals, and reports of research institutes.

Comments of the respondents indicate that interaction, openness and discussion were emphasized in finding weak signals.

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