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Weak Signals in Organizational Futures Learning

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To Kari
To Emilia and Otto

Acknowledgements

This has been a long project. It started as early as 1998 when I began my post-graduate studies at the Helsinki School of Economics. Since then I have also worked at the Helsinki University of Technology, the Finland Futures Research Centre and Nokia. I have given birth to two children, become the owner of two dogs, moved twice, and built one house. I have also started my own consulting business, What's Next Consulting, and most importantly, I spent four years at home taking care of the kids. It could be said that, luckily, doing a PhD has not stopped me from living.

Returning to my research after the years at home in 2006, I realized that my research material had gone obsolete, which meant I had to start my work all over again. And now, in April, 2010, I am in the happy position of writing the words of thanks to the people who have stood by me during this whole long process. One could think that a long PhD process is somehow painful. This is true. But the good part in this kind of a process is that you get to know very wise people, share your ideas with them and learn patience among other things. This has certainly happened to me.

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Professor Sohail Inayatullah and Professor Antti Ainamo have been the examiners of this thesis. They have really focused on my writings and thinking by reading through this thesis, providing valuable comments for improving my thesis. I want to thank Professors Inayatullah and Ainamo for sharing their wisdom with me in the form of their valuable comments and the time they have used for reading through and commenting on my thesis.

There are, of course, other people who have had their influence on this process. I started my process when working at the Helsinki School of Economics in the end of 1990s in IDBM program, and I could say that my PhD studies are due to one man: my former boss Doctor Markku Salimäki. Thank you, Markku, for pushing me into this project! There are also many other people within the Discipline of Organization and Management and the International Business Faculty who have encouraged me in this process. Thank you for your support.

I have also had the wonderful opportunity to work with the enthusiastic futures-oriented people of the TULIO postgraduate program at the Finland Futures Research Centre. Professor Markku Wilenius and Director Juha Kaskinen – you are among the people to whom I want to express my gratitude for helping me in this process. Special thanks go to Professor Sirkka Heinonen, who has helped me with testing the Futures Windows process and who has always been open for my new ideas. Of course, all my colleagues in FFRC: Thank you for your support to my process and your nice company. I really enjoyed working at FFRC.

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For proof-reading, I want to thank James Collins, Pekka Jääskeläinen and Amanda Heikkinen. Thank you for reading my thesis and making the corrections. The good news is that the project is now finished and you are not required to correct this thesis anymore. This is why I will change the language now to Finnish.

Elämä ei ole pelkkää työtä ja väitöskirjaprojektia. Parasta elämä on silloin, kun ympärillä on perhe ja ystäviä. Tässä mielessä minä olen ollut hyvin onnekas nainen. Haluan esittää kiitokseni lukuisille ihanille ystäville, jotka ovat olleet minulle tukena vuosien ajan. Heille, joiden kanssa olen voinut jakaa elämään liittyvät ilot ja surut. Heille, jotka ovat jaksaneet kuunnella ja vain olla lähelläni. Heille, joita minä olen saanut kuunnella ja jakaa myös heidän ilonsa ja surunsa. Mari, Aila, Peter, Amanda, Miku ja Tiina, Heidi ja Timo, Oili ja Tero, Kirsi ja Pekka, Minnat ja Raisa ja muut hyvät kaverini: kiitos teille vuosien ystävyydestä ja kannustuksesta.

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Kun lähetin miehelleni Karille viestin siitä, että esitarkastajat ovat hyväksyneet väitöskirjani, sain vastaukseksi seuraavan mietelauseen, johon päätän tämän kiitospuheeni.

> *Ellet ota riskiä, et voi kasvaa, ellet voi kasvaa, et yllä kykyjesi mittaiseksi, ellet yllä kykyjesi mittaiseksi, et voi olla onnellinen, ellet voi olla onnellinen onko millään muulla sitten mitään väliä?*

Espoossa 14.4.2010 Elina Hiltunen

ABSTRACT

This thesis addresses the issue of anticipating future changes through weak signals and the role of weak signals in organizational futures[1] learning (OFL). The focus of the thesis is to examine weak signals and their related concepts and to test a tool, created by the author, for using weak signals to enhance organizational futures learning. This thesis consists of five articles that approach the dilemma of weak signals and organizational futures learning from different angles.

In the existing literature there appears to be difference on opinion of the definition of weak signals. The meaning of the concept, weak signals, varies from researcher to researcher, and thus the understanding of weak signals and utilizing them in organization can be challenging. Sometimes weak signals are considered emerging issues or wild cards- some of the researchers consider them as first indication of change. This thesis introduces a new concept *the future sign*. This represents the holistic picture of future change. The future sign clarifies the discussion by presenting various dimensions of the change; signals, issue and their interpretation. This thesis also assesses the change process (signification process of the future sign), different kinds of signals in it and the role of actors in the change process. One of the outcomes of this assessment is that signals do not always reflect the true state of the emerging issue, which calls for digging into the primary sources of information.

This thesis examines also organizational futures learning from different viewpoints, like the sources that are used for finding weak signals and the method for disseminating weak signals within organizations. A study asking "what are futurists' top sources for finding weak signals" revealed that one's personal contact network is appreciated the most. A Futures Window, a tool for disseminating weak signals in organization was also tested in this thesis. The study revealed that using visual weak signals in sharing futures information was received well.

Key words: weak signals, wild cards, the future sign, signification process, sources of weak signals, the Futures Window, organizational futures learning.

[1] Futurists prefer to discuss the plural of the word future i.e. future**s**, emphasizing the fact that we should always consider various possible futures- and not limit the focus on a single one. In this thesis this form is adopted.

TABLE OF CONTENTS

PART I

APPENDICES:

PART II ARTICLES

1. Hiltunen, E. (2006) Was It a Wild Card or Just Our Blindness to Gradual Change? *Journal of Future Studies*, November, Vol 11:2, pp. 61-74.

2. Hiltunen, E. (2008) The Future Sign and Its Three Dimensions, *Futures*, April, Vol. 40:3, pp. 247-260.

3. Kuusi, O. & Hiltunen, E. (2007) *The Signification Process of the Future Sign*, FFRC eBooks, Finland Futures Research Centre, Turku School of Economics, ISBN 978-951-564-510-4.

4. Hiltunen, E. (2008) Good Sources for Weak Signals: A Global Study of Where Futurists Look For Weak Signals, *Journal of Future Studies*, May, Vol. 12:4, pp. 21-44.

5. Hiltunen, E. (2007) The Futures Window – A Medium for Presenting Visual Weak Signals to Trigger Employees' Futures Thinking in Organizations*, HSE Publications*, working paper- w-423.

PART I: Summary

1 Introduction

This is a thesis about weak signals and their use in organizations as part of organizational futures learning. The thesis consists of summary part and five articles that deal with weak signals from different points of view. The structure of this thesis in presented in the Figure 1.

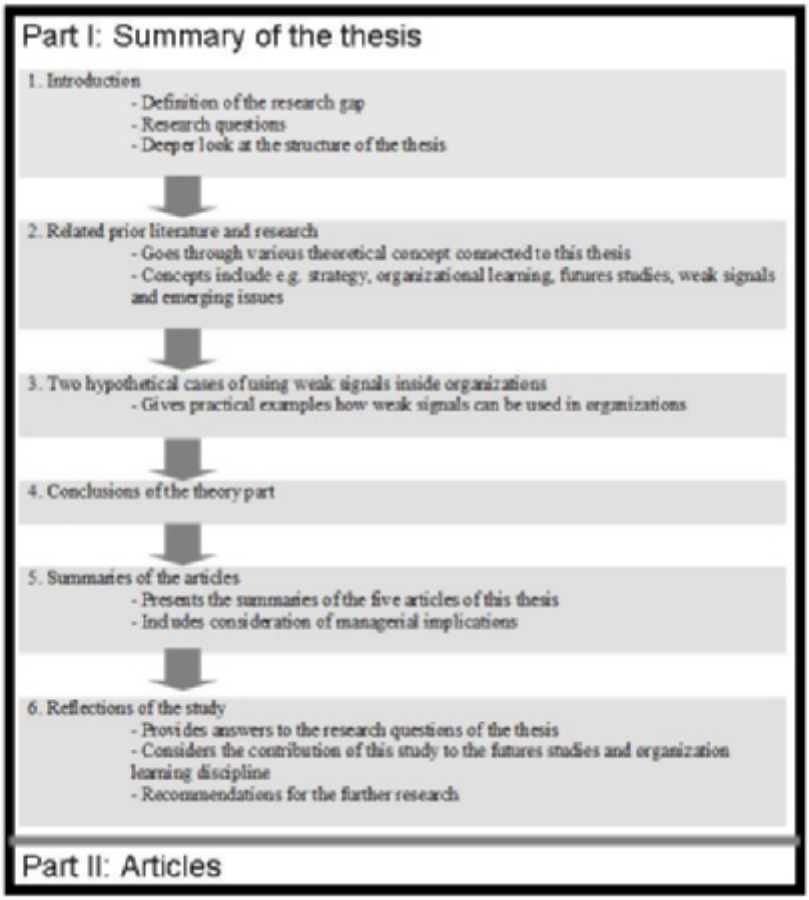

Figure 1. Structure of this thesis.

There are six chapters in this summation part of the thesis. The first is an introduction chapter, which establishes the scope and purpose of the study. The second chapter focuses on prior literature and research related to the areas of strategy process, scenario approach, environmental scanning, cognitive psychology, organizational learning and weak signals and emerging issues. In particular this explores Ansoff's (e.g. 1984) and Molitor's (e.g. 1977) role in connecting organizational learning, weak signals and emerging issues. Chapter 3 presents two cases how weak signals could be used in an organization. Chapter 4 concludes the theory part. Chapter 5 summarizes the five articles and their findings and in chapter 6, the answers to the research questions proposed in this study are presented.

In addition to the introduction chapter this study includes five articles. Three of them were published in international journals that include a blind-review process of at least two reviewers (Articles 1, 2 and 4). Article 3 was published and as working paper in the Finland Futures Research Centre e-working paper series, and Article 5 in Helsinki School of Economics working paper series. The titles of the five articles are:

1. Hiltunen, E. (2006) Was It a Wild Card or Just Our Blindness to Gradual Change? *Journal of Future Studies*, November, Vol 11:2, pp. 61-74.

2. Hiltunen, E. (2008) The Future Sign and Its Three Dimensions, *Futures*, April, Vol. 40:3, pp. 247-260.

3. Kuusi, O. & Hiltunen, E. (2007) *The Signification Process of the Future Sign*, FFRC eBooks, Finland Futures Research Centre, Turku School of Economics, ISBN 978-951-564-510-4.

4. Hiltunen, E. (2008) Good Sources for Weak Signals: A Global Study of Where Futurists Look For Weak Signals, *Journal of Future Studies*, May, Vol. 12 :4, pp. 21-44.

5. Hiltunen, E. (2007) The Futures Window – A Medium for Presenting Visual Weak Signals to Trigger Employees' Futures Thinking in Organizations*, HSE Publications*, working paper- w-423.

1.1 Background and research gap

This study was carried out for various reasons. Firstly, organizations face the challenge of the changing business environment every day; this necessitates the need for organizational renewal. In order to survive organizations must be sensitive to emerging changes as early as possible so that they have better time to react or to be in time to utilize the opportunities of an emerging change. In recent years the concept of weak signals and emerging issues has come to the attention of researchers publishing in the strategy literature and in the literature on futures studies, and as a special interest among researchers and consultant as a tool for anticipating change (see for example Ansoff, 1975, 1980, 1984, Molitor, 1977, 2003, Coffman, 1997 (a-e), Ilmola & Kuusi, 2006, Mannermaa, 1999a, 1999b, 2004, Day & Schoemaker, 2006 & Silvan, 2006).

Figure 2 by Coffman (1997d) shows the utility of early recognition of weak signals of emerging changes for organizations. Even though the risks of adapting organizations' actions on the basis of weak signals are high, the opportunities for organizations could be great.

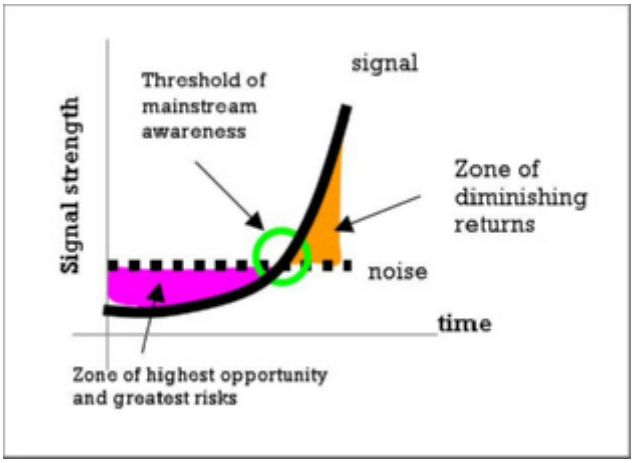

Figure 2. Growth of weak signal in noisy channel (Source: Coffman, 1997d).

Secondly, in addition to the specific need to map the risks and benefits of working with weak signals, a need for innovativeness is generally necessary in organizations for renewal (see for example Drucker, 2007). With the issue of innovation in mind the concept of futures for organizational learning will be obviously of interest for years to come. The assumption in this study is that scanning, analyzing, synthesizing, and acting on weak signals are essential for innovation. Weak signals are signals of emerging issues, and can sometimes hint about future changes.

Thirdly, despite of much work, the definition of organizational learning is still elusive and there exists different views of how academics see it (see Crossan et al., 1999, Garvin, 2000, Templeton et al., 2002 & Sun, 2003). A general way to define organizational learning is *"Organization-wide continuous process that enhances its collective ability to accept, make sense of, and respond to internal and external change. Organizational learning is more than the sum of the information held by employees. It requires systematic integration and collective interpretation of new knowledge that leads to collective action and involves risk taking as experimentation*."[2]. An academic examination of organizational learning theories will be reviewed in section 2.2 of this study. Following the definition and review what I call "organizational futures learning" (OFL) is developed in this thesis. OFL is defined as *organization's learning about possible future threats and possibilities based on today's evidence of futures*[3] *(e.g. weak signals). OFL is a process that includes collectively becoming aware, obtaining, collecting and making sense of future oriented information such as weak signals, trends and megatrends. Studying this information, analyzing it, disseminating it inside an organization, interpreting it, sharing it and using it in the organization's various processes (like strategy process)- and in creating the future (new strategies, products, and services) is a higher-level definition of OFL.* The difference

[2] Organizational learning. BusinessDictionary.com. WebFinance, Inc. http://www.businessdictionary.com/definition/organizational-learning.html (opened: December 29th 2008).
[3] Futurists prefer to discuss the plural of the word future i.e. future**s**, emphasizing the fact that we should always consider various possible futures- and limit the focus on a single one. In this thesis this form is adopted.

between organizational learning (OL) and OFL is more specifically the strong emphasis on the future in OFL, which does not only include anticipating the future but also creating it by being inspired by future-related information. The special emphasis in OFL, as I define it, is on weak signals, which provide the most potential (but the same time the most risky) information about the future. Table 1 summarizes some basic assumptions of this thesis regarding weak signals.

Table 1. Basic assumptions of weak signals in this thesis.

What are weak signals?	Weak signals are first signs of emerging issues. Their visibility is characteristically low.
Why are weak signals important?	With weak signals it is possible to try to anticipate the future changes. By this it is also possible to affect to the changes or make one's response strategies for the changes. They also help in innovating the futures by breaking the mental models.
Where have they been used before?	Weak signals have been used in the strategic issue management system (Ansoff, 1984), futures studies (for example Kuusi et al. 2000, Mannermaa, 2004), early warning system (for example Nikander, 2002). A sister concept, emerging issue, has been presented by Molitor, 1977.
The main contributors in the field of weak signals (and emerging issues)	Ansoff (weak signals, e.g. Ansoff, 1984) Molitor (emerging issue analysis, e.g. Molitor, 1977) Coffman (weak signals, Coffman, 1997)

This study draws from my professional work where I have created an informal "test" of weak signals. The purpose of this "test" has been to encourage employees to spot and talk about weak signals. In line with my professional experience, I have come to believe that if a potential piece of futures information, when stated in the coffee table, causes at least one of the following reactions in colleagues it can be considered as weak signal:

1. Makes your colleagues laugh
2. Your colleagues oppose it: 'no way, it will never happen'
3. Makes people wonder
4. No one has heard about it before
5. It is understood that no-one talks about it anymore (a taboo)

Even though the above is by no means an exhaustive scientific list or crystallization of the potential worth of weak signals, it does already emphasize some of the characteristics of weak signals: their *low visibility* (no one has heard about it before), and being a *signal of new emerging issue* (items 1, 2, 3, 4, and 5). More fundamental examinations (Articles 1-3) reveal that definition of a weak signal is quite a complex issue.

Of course, a single weak signal cannot reveal the secrets of the future. According to Coffman (1997d) for example, the key in using weak signals is to rely on the power of a number of signals of emerging issues. If a number of weak signals are pointing to some development path in the future, the possible development can be taken more seriously than with one weak signal. However, when trying to anticipate the future, it is important to keep in mind its potential for 'causing' various futures or possibilities. We cannot predict the future, and that is why futurists usually refer to the plural of the word: futures. This should be considered when dealing with weak signals, too. Rather than betting on only one forthcoming development path indicated by a condensed occurrence of signals, one ought to remember that the world is much more complex. More than giving straightforward forecasts of the future, weak signals are more useful for thinking *"what if"* questions and multiple futures.

Besides anticipating the futures, weak signals can also be utilized in innovating and creating futures. The advantage of weak signals is, because they are new and even surprising, that they can break our prevailing mental models and encourage us to think differently. This is why, they can be used in innovation processes; for example in new product development or in exploring strategies for new markets.

What are weak signals then in practice? Practical examples are news stories of single events, new businesses and business ideas such as retirement homes for dogs in Japan, or observations of new issues or ways of doing things (like the computer game that works by pedaling a stationary bicycle; see Figure 3). Weak signals can also be news about new innovation. An example of this kind of weak signal is the story reported by Wired Blog about a new technological innovation, exoskeleton (see Figure 4), a robotic suit specially designed for soldiers or police that would markedly increase their physical strength (source: http://blog.wired.com/defense/2007/11/video-fix-super.html, opened 11th Dec 2007).

Figure 3. Children playing a computer game by pedaling stationary bicycles.

Figure 4. Exoskeleton (drawing by Elina Hiltunen).

How can organizations identify the important weak signal among all the signals in the world? The short answer is that they cannot. The value or worth of a single weak signal can be judged only with hindsight. As previously outlined, the key with weak signals is collecting sufficient quantities of them in order to try to form patterns that can inform about possible changes. Kuosa (2005), drawing implicitly on Kuhn (1962), discussed pattern management connected to analyzing weak signals. He commented that pattern management of the future possible changes is similar to building a jigsaw puzzle, where all the pieces of the puzzle represent a part of the bigger picture. By combining these pieces together one can anticipate the holistic picture (change). Signals that are not valid for this picture will not fit the other pieces (Kuosa, 2005). They can be pieces that are suitable for another jigsaw puzzle (i.e. these signals can indicate other changes).

If, by reference to the two examples mentioned above (Figures 3 and 4), we can attach these signals (pieces of a puzzle) to other pieces, we could try to anticipate future changes. By recombining the robotic suit story with other signals like the story of a bionic hand (i-Limb hand from Touch Bionics Internet pages www.touchbionics.com), news about a bionic contact lens (by National Geographic News[4]) or other such weak signals, one can extend new visions such as a future cyborg human being, an extension of human life, and better medical care for spinal cord injured patients. These kinds of visions help companies to create strategies, whereby they allocate research and development resources for venturing with other companies and for creating futures. Thinking of future potentialities also helps companies to examine their strategic "Achilles' heels" for the future. But as will be highlighted in Articles 2 and 3 of this thesis, a focus solely on weak signals is not recommended. The possibility is that such signals are distorted or even fictitious. Detective work should be carried out to discover what the objective emerging issue is that the weak signal is indicating.

Figure 5 and Figure 6 illustrate the thinking of weak signals in this thesis. Weak signals are connected to emerging issues as being "evidence" of the emerging issues, or signals of them. Interpretation of the signals affects the actions of the actors. In this thesis, this combination is called the future sign (Figure 5).

[4] "Bionic" Contact Lens May Create Tiny Personal Displays http://news.nationalgeographic.com/news/2008/01/080129-bionic-eye.html opened 29th December 2008.

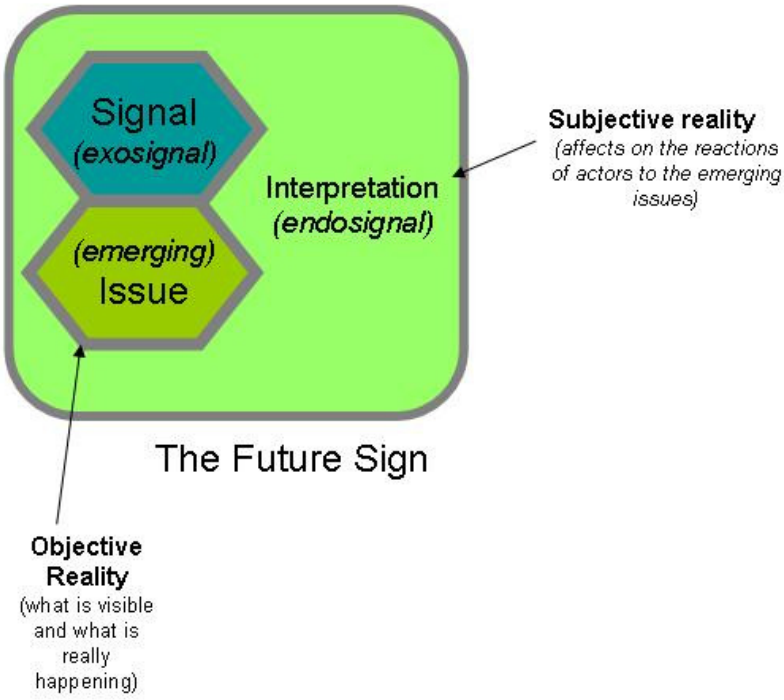

Figure 5. The Future Sign concept includes emerging issues, weak signals and interpretation.

Emerging issues (and weak signals as evidence of emerging issues) can reveal possible future trends, megatrends and wild cards (highly impacting, rapid events with huge consequences). On the other hand, emerging issues can only be occasional fluctuation. This is explained in Figure 6.

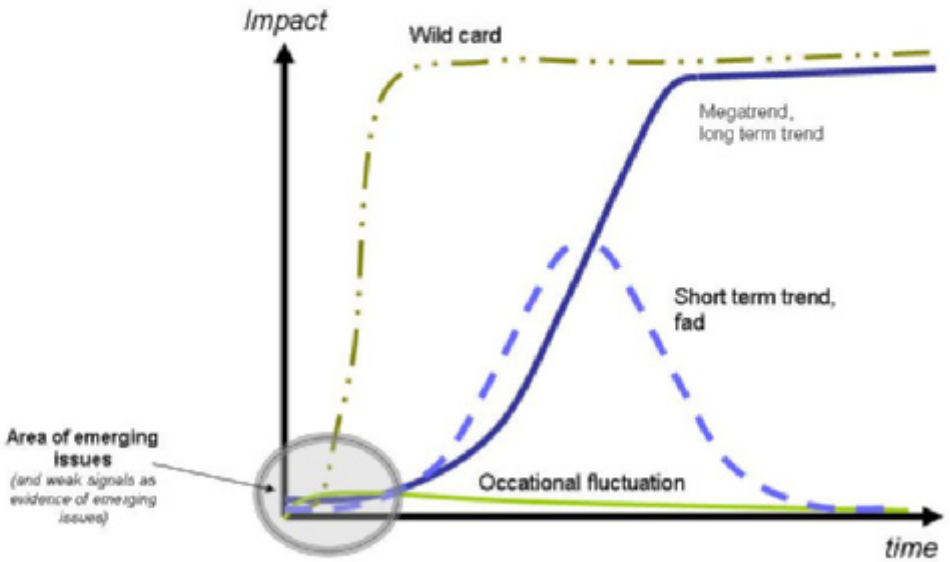

Figure 6. Emerging issues (and weak signals) and their relationship to forthcoming changes.

Even though the definition of weak signal is both an interesting and fundamental question in practice, the examination of the use of weak signals in academic strategy research is also important. Such research can provide new procedures of how organizations could use weak signals in their strategy or innovation processes. There are already some views of how to use weak signals in the organizational context (see for example; Ansoff, 1984, Coffman, 1997e & Day & Schoemaker, 2006). These views vary from theoretical and complex process charts to hints of how to operate in organizations in order to be attentive to change.

There is a need for more research on the concept of weak signals. The need relates to the various often conflicting definitions of weak signals in the previous literature and the need to understand how these conflicting views can contribute to the discussion. By analyzing

the change process and providing a robust definition of weak signals in research and in practice a better understanding of the possibilities to use weak signals in organizational futures learning can be achieved. Furthermore, there is a lack of tools for utilizing weak signals in organization futures learning. This study is designed to provide such a tool, the Futures Window, which aims to provide an innovative framework for collecting, disseminating and analyzing weak signals.

1.2 Research questions of the study

The thesis is build around of two principal research questions with sub-questions. They are presented here. The main research questions of this study are:

1. *How are weak signals defined in the existing literature and how could this concept be clarified further?*
2. *How can organizations scan and use weak signals?*

The first research question includes sub-questions that result from the unclear definitions of weak signals. This principal question is answered by addressing the following sub-question:

a) What are weak signals and how does the concept differ from related concepts (i.e. wild cards)?
b) How does strategic change happen and how are weak signals related to this?

The second research question is related to application of OFL in strategy work.

With regard to the first research question, I reviewed the relevant literature and the various views of weak signals, as well as concepts related to it (such as wild cards). There appeared no common accord about the concept of weak signals, and the term is used in varying and

inconsistent ways in the literature. For this reason I developed a meta-level integration of the different concepts and the relationship between weak signals and change processes were examined in this thesis. With regard to the second research question, I carried out two empirical studies. In the first study, during the spring of 2007, I asked futurists or future oriented people to answer questions concerning good sources of weak signals. I selected futurists as the target research group, because their work is to constantly think about future changes and look for signals of such change. The second empirical study related to creating and testing a tool, the Futures Window that is used for collecting, disseminating and analyzing weak signals in organizations. The tool was developed in order to improve organizational futures learning. As with all studies there are limitations in this study too, and these are considered in section 6.5.

The relationship of the articles to the research questions of this thesis are presented in Figure 7.

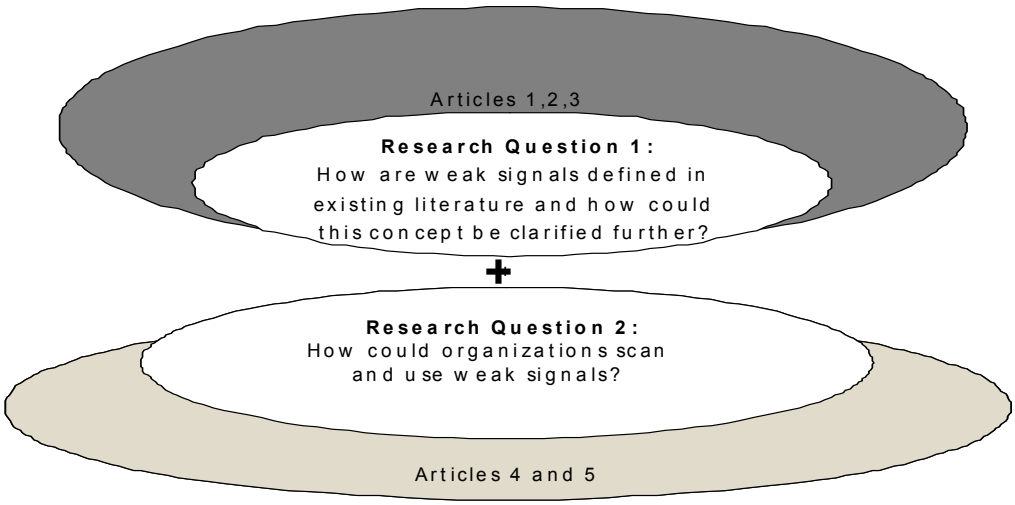

Figure 7. Articles/papers of this thesis and their relationship to the research questions.

2 Related prior literature and research

Important topics in this study as a whole have been: *strategy formulation, strategic foresight, environmental scanning, organizational learning, weak signals,* and *emerging issues* (along with related concepts). I have described their inter-relatedness in Figure 8.

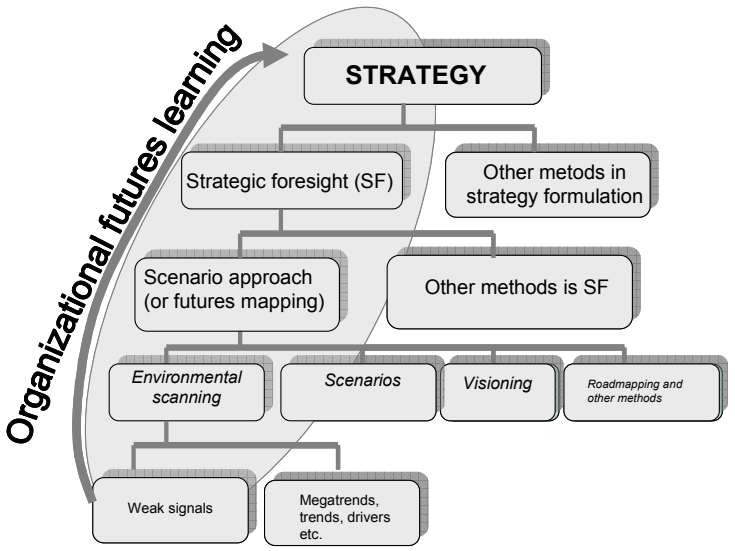

Figure 8. Strategy work and its link to weak signals (and emerging issues).

Figure 8 represents strategy work and its link to weak signals. The focus of the thesis is on weak signals, but it also covers the areas marked by an ellipse. The arrow in the Figure 8 describes the flow of information about weak signals to the strategy process. This is connected to what I call organizational futures learning. This concept is the contribution of this study to research on strategy and organizational learning.

Weak signals are information about emerging issues and potential future changes that can be observed through environmental scanning (see for example Ansoff, 1984). The information can be used for example in scenario work and the strategy-making process. Weak signals can be considered essential from an organizational perspective, because giving hints of the future, which provides possibilities for organizations to prepare in advance for that future. All of elements discussed above are connected to the organizational futures learning perspective, because observing weak signals brings an element of learning to the organization. The notion of perceiving and processing information, drawing on cognitive psychology, is also touched in this thesis because it considers the essential view concerning people's ability to perceive and sense weak signals. In particular the theory of visual perception enlightens the advantages of using images as tools for disseminating weak signals (Article 5).

The sections that relate to the principal theories that contribute to the articles of this thesis are presented in Table 2, where the grey coloring marks that this paragraph has been essential for the article. Slanted lining means that the paragraphs have contributed more generally.

Table 2. Theories relevant to this thesis.

Paragraph/ **Article**	**Article 1**	**Article 2**	**Article 3**	**Article 4**	**Article 5**
2.1 What is strategy: a process and foresight	**GENERAL**				
2.1.1. Scenarios: tools for planning for the futures					
2.1.2 Environmental scanning: a tool for strategic foresight work					
2.2 Organizational learning and change, an information processing view					
2.2.1 Deepening the understanding of the futures by critical, poststructural thinking					
2.3 Defining information and concepts connected to it					
2.3.1 Perceiving and processing information					
2.3.2 Attention as a prerequisite for perceiving information					
2.3.3 Visual perception and images as stimulus					
2.4 Combining future studies and organizational learning- following the footsteps of Ansoff					
2.5 Early notions of weak signals and emerging issues					

2.1 What is strategy: a process and foresight

Let us review some concepts, what is strategy. Etymologically, the concept of strategy derived from the Greek substantive *strategos*, leader of the troops, which in turn is derived from the 'army' and 'lead' (Ahonen, 2004). In the corporate environment, the concept strategy can be considered to have emerged with the publication of Ansoff's book *Corporate Strategy*, in 1965 (Lahti, 1983 & Bougeios, 1997).

According to Hax (1994:9) strategy can be described as: "Shaping the long term goals and objectives of an organization; of defining the major action programs needed to achieve those objectives; and of deploying the necessary resources." Porter (2005:14) stated that "Strategy is what makes you unique, gives you a distinct competitive advantage, provides direction, builds brand reputation, sets the right goals, add superior performance, defines a market position, and creates a unique value proposition. In formulating strategy, you have to choose what to do (and what not to do), what customers to serve, and what needs to meet at what price." Porter (1999) also emphasized that strategy is a concern for distinguishing from ones competitors. According to Porter (2008:43): "… the essence of strategy is in the activities— choosing to perform activities differently or to perform different activities than rivals". Meristö (1987) described strategy as a selected path to the future of an organization. She considered strategic planning to be finding and creating that path (Meristö, 1991).

Because of the popularity of the topic there are a variety of views (schools) regarding the nature of strategy planning and how it should be applied in an organizational environment (see for example Mintzberg, 1994 & Mintzberg et al., 1998). One view of the strategy process is presented by Wheelen & Hunger (1994), who described the process of strategic management as involving four basic elements: environmental scanning, strategy formulation, strategic implementation and evaluation and control. According to Wheelen & Hunger (1994) *environmental scanning* includes scanning the external environment (task environment and societal environment) for threats and opportunities and the internal

environment for strengths and weaknesses. *Strategy formulation* includes development of long-range plans for the effective management of environmental opportunities and threats, while at the same time taking into account a corporate's strengths and weaknesses. *Strategic implementation* is the process by which strategies and policies are put into action and *evaluation and control* includes monitoring corporate activities and performance (Wheelen & Hunger, 1994).

If in the second half of the last century strategic planning has been one of the top items in business literature and discussion, today more focus has shifted to adding the component of strategic foresight to corporate planning. Wheelwright (2006:24) enlightened the differences of strategic planning and strategic foresight in the following way: "It is important to recognize the distinction between 'strategic planning' without a futures component, as it has been generally practiced over the past decades, and 'strategic foresight', which includes exploration of the future (such as scenario development) as a critical part of the strategic process." Foresight or futures methods are numerous (see for example May, 1996). Inayatullah (2008) has presented six pillars to futures thinking for transformation. These pillars are related to methods and tools in foresight practices. The pillars are: *mapping* (includes methods: shared history, the futures triangle, the futures landscape), *anticipating* (includes methods: emerging issues analysis, the futures wheel), *timing* (search for the grand patterns of history and identification of our models for change), *deepening* (includes methods: Causal Layered Analysis and four-quadrant mapping), *creating alternatives* (includes methods: "nuts and bolts" and scenarios), and *transforming the future* (includes backcasting and transcend methods) (Inayatullah, 2008).

Strategic foresight methods, the scenario techniques, for instance, have been used actively by many multinational companies such as Royal Dutch Shell (www.shell.com/scenarios/), Microsoft (http://research.microsoft.com/) and Nokia, as well as non-commercial organizations and nations. With regard to multinational corporations Royal Dutch Shell has been a pioneer in using scenarios—it included this technique in its strategic planning as early as the 1970s (Ringland, 1998).

The scenario method is used by organizations to prepare for future possibilities and for sharing companies' visions about futures to the public. They can also be used to obtain new business ideas. Ringland (1998) linked scenario planning to strategic planning; the latter relates to the tools and technologies for managing the uncertainties of the future. She listed some examples of success stories of scenario work in corporations. Scenario planning helped Electrolux to spot new consumer markets, Pacific Gas and Electronic to prepare for an earthquake in California, for Shell to anticipate the fall of Communism in Russia and its effect on natural gas price, for the Austrian insurance company Erste Allgemeine Versicherung to anticipate the fall of Berlin Wall and enter new markets in Central Europe, and for the wiring and cable supplier Krone to develop 200 new product ideas (Ringland, 1998). Rather than predicting, the purpose of foresight techniques is to open our mental models to think of different possibilities of futures and activate our preparedness to various chains of actions. They can also help us to think 'outside the box'; for example in product or service concepting and developing.

2.1.1 Scenarios: tools for planning the futures

The origins of scenarios planning, 'alternative futures', is found in the US military based think tank RAND, an organization which can also take credit for some of the other new methods in futures research such as computer-assisted games involving role playing, computer simulations, and technological forecasting methods including the Delphi technique (Dickson, 1972 cited in Bell, 2005). Herman Kahn and his RAND colleagues wrote serious fiction that was to be used by U.S. military planners thinking of the most terrible weapons to be devised. These stories with chains of events in the future were named scenarios; in accord with the old Hollywood word for screenplay (Cornish, 2004). Scenarios about the future were presented for the first time in the literature in Kahn's report at RAND "Thinking about the Unthinkable: Scenarios and Metaphors", 1962 (Meristö, 1991).

It is not only the United States that has been the pioneer in scenarios and futures studies. Europe, and particularly France, has also been active in this field. According to Bell (2005) by the 1950's France was clearly an incubator of the modern futurist movement. Furthermore according to Söderlund & Kuusi (2002) the French philosopher and economist (and later futurist) Bertrand de Jouvenel was already planting the theoretical seeds of alternative futures in the 1960's and the French organization DATAR (the government based planning agency) was the first significant applier of the scenario approach.

At first scenarios were tools for military planning, but Kahn refined them for business forecasts in the 1960s. Prior to that time business forecasting methods relied on the assumption that the current trends could be extrapolated to the future. Scenarios were adopted in the business world because of the failure of traditional extrapolative forecasting methods in the 1970s (May, 1996 & Schwartz 1991). The first time they were successfully used in a company environment was at Royal Dutch Shell in 1970s when a futurist named Pierre Wack with his colleagues presented two scenarios relating to the price of the oil. In one scenario the price of the oil increased dramatically, which was not expected at that time. However when in 1973 the price of the crude oil did indeed increase dramatically, leading to the oil crisis, Shell was the only company in the oil industry prepared for the disruption (May, 1996 & Schwartz, 1991). The oil crisis was a total surprise for many companies because of problems regarding a major discontinuity of supply, and a need for methods to deal with these kinds of surprises emerged (May, 1996 & Schwartz, 1991).

In their book "The Year 2000- A Framework for Speculation on the Next Thirty-Three Years" Kahn & Wiener (1967:6) defined scenarios as "hypothetical sequences of events constructed for the purpose of focusing attention on causal processes and decision-points. They answer to two kinds of questions: 1) precisely, how might some hypothetical situation come about, step by step? and 2) what alternatives exist, for each actor, at each step, for preventing, diverting, or facilitating the process." Meristö (1991) labeled *scenario* as a script of the future that holistically outlines the possibilities of the business environment based on certain assumptions and describes development paths from present to the future.

Schwartz (1991:6) crystallized the notion stating "Unlike traditional business forecasting or market research, they (scenarios) present alternative images of the future; they do not merely extrapolate the trends of the present." Thus, scenarios are not forecasts. They are ways to open our minds to look at different alternatives in the future. There are many forms of scenarios including narratives, videos, images, and plays. Schwartz (1991:4) stated that "They (scenarios) resemble a set of stories, either written out or often spoken. However, these stories that are built around carefully constructed 'plots' that make the significant elements of the world scene stand out boldly."

There is a difference between the concept of scenario and the scenario approach or method (also called as futures mapping). However, they are sometimes mixed in the literature. The scenario approach according to Meristö (1991) includes the development of multiple (at least two) alternative scenarios about the business environment, descriptions of what a company can and want to be in these environments and finally formulating the strategy of company in the way that the information provided by scenarios is taken into account. May (1996:162) has written: "Scenario methods begin from the recognition of the unpredictability of the future, but acknowledges that we need to take decisions in the present that will have future implications." A further term used as a synonym for the scenario approach is "futures mapping" (Kuusi & Kamppinen, 2002). To make distinctions between scenarios, the scenario approach, scenario methods or futures mapping Kuusi & Kamppinen commented that a scenario is a description of one path to the future while, (futures) maps include outlining all the relevant features of a future by scenarios or other analysis tools (Kuusi & Kamppinen, 2002).

In futures mapping, Kuusi & Kamppinen (2002:163) presented an example of stages: 1) description of the present stage 2) considering the shared vision 3) identifying megatrends 4) identifying weak signals 5) making scenarios 6) preparing action strategies for scenarios 7) planning actions for near future. Thus futures mapping or the scenario approach includes various phases and tools such as visioning, environmental scanning (trends and weak signals), making scenarios and developing strategies.

Roadmapping is also a tool that is used in the scenario approach or futures mapping. It is particularly used within companies as a tool for technology strategies. Roadmaps can be defined as visualization of strategy or strategy elements and they have two distinct roles: 1) they establish the necessary linkages over the planning period between all business functions to meet prioritized targets and 2) they provide a palette upon which alternative strategies, future business scenarios and innovative-driven opportunities can be assessed (Whalen, 2007).

Mercer (1995) described the process of forecasting (which here, by definition, resembles the scenario approach or futures mapping) including three progressive groups of activities: environmental analysis, scenario planning and corporate strategy. He underlined that "Scenarios can only be as good as the information they are based upon" (Mercer, 1995:82). He also encouraged that a deeper interest of the external environment should be examined. Environmental scanning, which will be discussed further in the following section, is a tool for organizations to detect the weak signals of the business environment for foresight practices. It is scanning the environment in order to find hints about future changes. Day & Schoemaker (2006:198) commented that "A scenario based strategic planning process can be valuable tool in scoping as well as in making sense of and acting on weak signals from periphery."

Van der Heijden et al. (2002) emphasized the role of scenarios in organizational learning. They discussed about adaptive organizational learning, which combines cognitive and action, in form of scenario process. According to them (2002: 179) "Scenario planning contributes to the learning process at both the individual and the group level, in a number of ways and across a wide range of arenas." They underlined that scenarios help organizations to experience the changes in the environment by creating organizational "memories of the future".

2.1.2 Environmental scanning: a tool for strategic foresight work

In the strategic foresight work of organizations in order to anticipate change it is important to look for emerging issues through their weak signals as well as trends and megatrends in the business environment. This activity is called environmental scanning. Albright (2004:40) noted that "Environmental scanning helps to focus the organization's strategic and tactical plans on those external forces that may threaten its stability and turn those potential problems to its advantage. "

Aguilar (1967:1), one of the first major influential people in the field of environmental scanning, defined environmental scanning as "an activity for acquiring information." Recognizing Aguilar's work Choo (2000:82) added that "Environmental scanning is the acquisition and use of information about events, trends, and relationships in an organization's external environment, the knowledge of which would assist management in planning the organization's future course of action". Weak signals are one crucial aspect of the environmental scanning process. Based on weak signals it is possible to start to think about alternative scenarios for the future and formulate strategies based on these scenarios. According to Albright (2004:38) "Environmental scanning focuses on the identification of emerging issues, situations, and potential pitfalls that may affect an organization's future." Of note here is the reference to emerging issues. The reason why this is important was noted by Quinn (1994) who emphasized the risk for organizations in reacting to signals too late. This might lead that smooth, efficient transitions may be impossible.

From the point of view of strategic foresight, environmental scanning is the first step of the process, and the success of the strategic foresight process is based on the quality of environmental scanning. Environmental scanning (knowledge acquisition) is also an essential concept in organizational learning. When looking at futures, it is important to broaden the scope of scanning the environment. In practice this means not only focusing on scanning the changes in one's own industry, but including a wider aspect of looking at

change. Aguilar (1967) commented that the need to look far into the future greatly broadens the environmental boundaries of search.

Neufeld (1985:39) crystallized 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." Compared to competitor intelligence, competitive intelligence and business intelligence, environmental scanning has more long-term time horizon and boarder scope of information gathering (Choo, 2000).

Aguilar (1967) introduced four modes of scanning the environment: undirected viewing, conditioned viewing, informal search and formal search. Developing these ideas Choo (2000) divided the modes of scanning according to dimensions of a company's assumptions about the environment and organizational intrusiveness. He relabeled Aguilar's modes as undirected viewing, conditioned viewing, enacting, and discovery. Organizations with different assumptions about the environment and with different levels of intrusiveness prefer to use different types of environmental scanning modes. From the point of view of looking for weak signals undirected viewing is the most valuable way of looking at the environment. According to Choo (2000) external, personal sources, casual information, irregular contacts and reports are ways to seek information in this mode. As Quinn (1994:125) commented "Most major strategic issues first emerged in vague or undefined terms…Some appeared as 'inconsistencies' in internal action patterns or 'anomalies' between enterprise's current posture and some perception of its future environment". In searching for indicators of change Doz et al. (2001) suggested looking for leapfroggers, thinking through metaphors from other industries, identifying locations where technologies are converging and looking for lifestyle leaders. Inayatullah (2004) discussed about "future natives", people that for example are early adopters of new technology, question constantly paradigms, believe that future can be created, and create the future themselves. These kinds of people are also good sources to scan in order to spot changes.

El Sawy (1985:53) illuminated the need for environmental scanning in organizations: "As the business environment becomes more complex and dynamic, it becomes increasingly vital for top executives to scan the information environment to identify strategic threats and opportunities." However, it is not only for top executives that environmental scanning is important but also others in the organization at different levels. Environmental scanning is particularly essential for people whose role is in future developments. In this regard Neufeld (1985) commented that environmental scanning is at the heart of every method devised to study the future.

In looking to the future it is thus important to sense the weak signals that can hint about change. However, it should also be recognized that in order to be successful organizations also need routinized ways to seek information. Observing the existing trends are important from the point of view of anticipating future changes.

2.2 Organizational learning and change, an information processing view

The previous sections have dealt with strategy and foresight processes from an organizational point of view. A key question that remains unanswered is: how does an organization react to the change and renew itself? According to Carnall (2007:47) "Organizational learning is a vital component of effective change." Cunliffe (2008:105) defined organizational learning as "improving organization's, teams' and individual employee's ability to acquire and create new knowledge in order to improve organizational performance. She (2008:110) continued that "Organizational learning is usually defined as the process of generating and applying new knowledge as a means of improving organizational performance and increasing competitiveness."

In the academic literature there exist various opinions on the concept organizational learning, which have also been converted to "learning organization", a concept that is usually preferred by consultants (Argyris, 1999 & Easterby-Smith et al., 1999). Prange

(1999) studied the discussion around the topic organizational learning, and tracked its origins to the 1950's. Since that it has become a popular topic. Prange studied various theories in organizational learning and came to the conclusion that there exists great heterogeneity in the theories of this concept. She (1999:31) commented that "The search for an integrated theoretical approach to organizational learning may not be a 'good thing'", and that it is more interesting to look at *criteria for judging* organizational learning theories.

In the debate on organizational theory and change there exist various emphases on the concept. For example, Barr et al. (1992) underlined the manager's key position in respect to change, while Kaplan (2008) considered that a company's change is due to the interaction of people. Macdonald (1995) on the other hand emphasized the role of external information in the change process.

Furthermore, when discussing about organizational learning some authors underline various levels in learning (March & Olsen, 1976), and some underline the social interaction as a necessity for learning (Nonaka & Takeuchi, 1995). Argyris & Schön (1978) presented different kinds of processes for organizational learning and Huber (1991) included four key components to organizational learning. In Table 3 the views of some researchers concerning change and organizational learning are presented.

Table 3. Some perspectives on organizational change and learning.

Author	Main comments on organizational learning and change
March & Olsen, 1976	Organizational choice and adaptation happens on various levels: individual, organizational, and environmental.
Argyris & Schön, 1978	Single-loop learning, that is adaptive, is possible when the modifications of organizational actions are adequate to correct the error without challenging the existing norms. Double-loop learning, on the other hand occurs when correction of norms are needed. It is generative learning that creates new public maps.
Huber, 1991	Organizational learning includes: knowledge acquisition, information distribution, information interpretation and organizational memory.
Barr et al.,1992	-Managers' mental models are important - Mental models, that can no longer match or explain occurrences in the environment, must be altered and new understandings of the environment must be developed.
Macdonald, 1995	External information has an important role in the change process. This information is best sought by individuals rather than organizations.
Nonaka & Takeuchi, 1995	Human knowledge is created and expanded through social interaction (between individuals) between tacit knowledge and explicit knowledge. This is called knowledge conversation. At an organizational level knowledge creation is a continuous and dynamic interaction between tacit and explicit knowledge.
Choo, 2006	Organizational learning takes place when members respond to changes in the environment by detecting errors and correcting the errors through modifying strategies, assumptions, or norms.
Kaplan, 2008	A company is a collective of people with different cognitive frames, and that company's response to change is the result of interaction amongst these frames.

The most interesting views of organizational change and learning for the purpose of this thesis come from Macdonald and Huber. Both of them raised the role of information as a key one in these processes. From the point of view of organizational futures learning (OFL) weak signals are considered one form of this information. Macdonald (1995) highlighted a problem that discussion of organizational change has emphasized the internal (i.e. organization as a unit of analysis) factors of change more than external ones. He noted that external information has an essential contribution to internal change, because it is a necessity for change. This kind of information is best sought by individuals rather than organization. Macdonald (1995: 558) commented that "The essence of change in the organization is the external information required for learning, and that understanding of the process of change lies in appreciation, not simply of how this external information may be used within the organization, but of how this information is to be found and acquired beyond the confines of the organization or the discipline." Macdonald named this view "information perspective on learning organizations", where the role of external information is emphasized.

Huber (1991) discussed four concepts related to organizational learning with an emphasis on information; knowledge acquisition, information distribution, information interpretation and organizational memory (see Figure 9). Weak signals are connected to organizational learning in the phase that Huber (1991) called knowledge acquisition. This takes the form of scanning and sensing weak signals. In the information distribution futures information (weak signals, trends, megatrends) is shared inside the organization. This information is interpreted by various actors in the organization, and then saved in the organization's data storage (for example, documents and records).

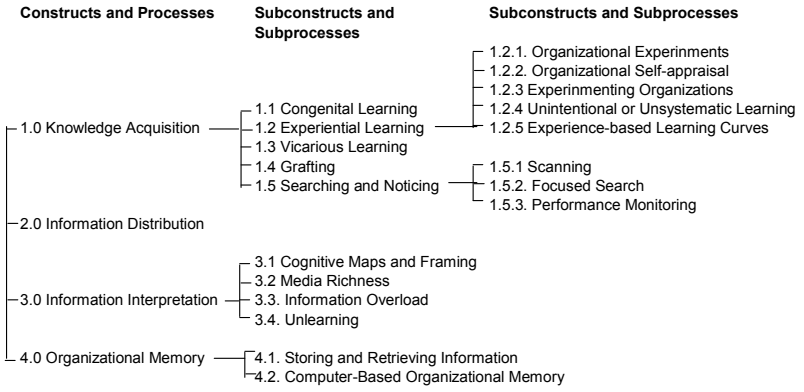

Figure 9. Constructs and processes associated with organizational learning (Source: Huber, 1991: 90).

Huber (1991: 89) commented that an organization learns "if, due to its processing of information, the variety of its potential behaviors is changed". Adapting Huber's words to the context of organizational futures learning: an organization learns about the future possibilities and threats if, due to its processing of future oriented information (weak signals, trends, megatrends etc.) the variety of its future actions are changed, and based on this it creates new solutions for the future. Huber (1991) also commented that a greater degree of organizational learning occurs when more of the organization's components obtain this knowledge and recognize it as potentially useful, and various interpretations are developed.

Hedberg (1981) has underlined the importance of unlearning in the process of organizational learning. According to Hedberg (1981:18) "Unlearning is a process through which learners discard knowledge. Unlearning makes way for new responses and mental maps." Poststructural (critical) thinking and tools for it, for example Causal Layered Analysis (CLA), help organizations to unlearn, and by that to learn new world views and to

open up for various futures. Poststructuralism and critical thinking are examined in the next sections.

2.2.1 Deepening the understanding of the futures by critical, poststructural thinking

Poststructural (critical) thinking is an excellent tool for organizational learning and unlearning, because it encourages us to dig into our deeper presumptions of the world we "see" around us. Inayatullah (1999:1-2) commented on the issue: "The goal of critical research is thus to disturb present power relations through making problematic our categories and evoking other places or scenarios of the future." Inayatullah (1999:2) continued about critical futures thinking: "The issue is less what is the truth but how truth functions in particular policy settings, how truth is evoked, who evokes it, how it circulates, and who gains and loses by particular nominations of what is true, real and significant." Critical futures thinking is widely affected by poststructuralism.

Poststructuralism is a way to lessen the burden of the history and culture in the perceived reality. One purpose of it is to question the truth and the knowledge, the world that we see around us. As Mills (1994:129) defined "Post-structuralism tends to emphasize the instability of meaning, the limitations of objective analysis and the importance of the social and historical context in which the object is interpreted." Foucault, one of the key persons in poststructuralist thinking, emphasized the challenges of knowledge. Sheridan (2005: 219) has clarified Foucault's thoughts of power: "Power and knowledge are two sides of the same process. Knowledge cannot be neutral, pure. All knowledge is political not because it may have political consequences or be politically useful, but because knowledge has its conditions of possibility in power relations."

The term poststructuralism originates from early 1970's, describing the affinity of thoughts of French theorists Derrida, Lacan, Foucault, Deleuze, Baudrillard, Lyotard and Kristeva (Johnston et al., 2000). It is a school of thought that draws on and extends the insights of structuralism (Johnston et al. 2000). Pope (2003:127) wrote: "Post-structuralism

concentrates on the 'holes in systems'. Put yet another way, where Structuralism concentrates on 'sense-making' activities, Poststructuralism concentrates on 'nonsense-making activities' or, perhaps better, 'the making of the sense other-wise."

This section presents two methods of critical futures research: Causal Layered Analysis and Poststructural Future Toolbox. Also, cultural aspects of deepening the futures understanding will be examined.

2.2.1.1 Causal Layered analysis

Vertical, or layered, approaches of futures studies do not neglect the horizontal thinking, but they add up some more layers into the methods. They try to open up the past and the present for us to think about various futures. Inayatullah (2002:480) commented that "Layered approaches do not argue for excluding the top level of the iceberg for bottom-of-the-sea analysis; rather, all levels are required and needed for fulfilling – valid and transformative – research."

Inayatullah has provided a practical method, Causal Layered Analysis (CLA) for vertical futures studies (see for example Inayatullah 1998). The purpose of CLA in not predictive, but to open up the past and present to create alternative futures (Inayatullah, 1998). Inayatullah (1998:820) emphasised that "Causal Layered analysis is based on the assumption that the way in which one frames a problem changes the policy solution and the actors responsible for creating transformation." CLA has four layers of analysis, which are presented in Figure 10.

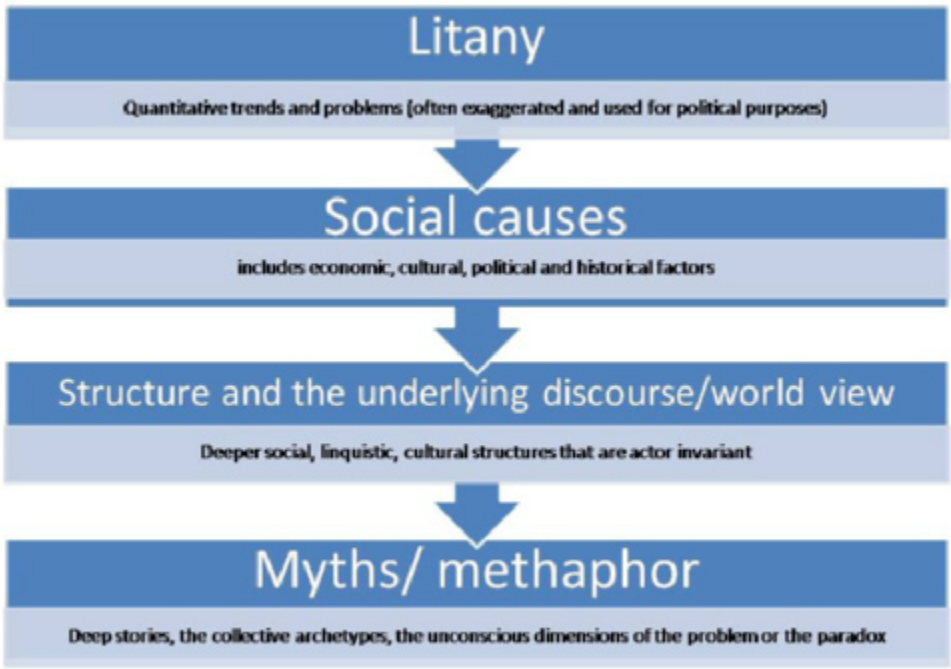

Figure 10. Causal Layered analysis, and its four levels (Inayatullah, 1998).

In CLA, the layers "litany" and "social causes" represent the visible dimension. They include quantitative trends and problems (litany) and economic, cultural, political and historical factors (social causes). The layers "world view" and "myths and metaphors", are more invisible and include deeper analysis of what is thought of when posing the problems. With Causal Layered Analysis, it is possible to rethink the questions of the future that have been posed. For example, reformulating the challenge of overpopulation using CLA could lead to various solutions, as it might approach the issue from different points of view."

Inayatullah (1998) listed the following benefits for using CLA in foresight workshops:

1. It expands the range and richness of scenarios
2. In workshops, it helps to include the participants' various ways of knowing

3. It incorporates non-textual and poetic/artistic expression in the futures process.
4. It layers the participants's positions
5. It moves the discussion from the obvious to a deeper level
6. It allows for a range of transformative actions
7. It leads to policy actions from the various levels of the analysis
8. It reinstates the vertical in social analysis.

CLA also helps to understand the deeper meaning weak signals as it enables diving into the various levels of the world. Analyzing the weak signals that appear, for example, in blogs, fringe journals or scientific magazines by using CLA could reveal the deeper meaning and the true potential of these signals for possible future changes. Also, using the various levels of CLA (the litany, social causes, world view and myths and metaphor) as avenues for finding weak signals could lead us to seeing new visions of the futures.

2.2.1.2 Poststructural futures toolbox and civilizational futures

Inayatullah (1999) has presented a poststructural futures toolbox, which is another example of critical futures thinking. This toolbox includes five elements: deconstruction, genealogy, distance, alternative pasts and futures, and reordering knowledge. *Deconstruction* aims to break a text into its components and to examine what is said and what remains unsaid. *Genealogy* focuses on the historical development of issues, while *distance* provides a theoretical link between poststructuralism and future studies. *Alternative pasts and futures* looks for links between past thoughts and their connection to the futures, and *reordering knowledge* examines, for example, the ordering on knowledge between various civilizations, gender and epistemes.

In poststructural thinking, the meaning of culture is important for deepening the understanding of the past, present and future. As Berger (1998:407) put it: "…culture is not a peripherical matter. In the final analysis, culture is the way in which the society

understands itself." Often, history, present and future are seen in the light of the dominant cultures. Inayatullah (1999: 2) argued that "Central to interpretive and critical approach is the notion of civilizational futures research. Civilizational research makes problematic current categories since they are often based on the dominant civilization (the West in this case). It informs us that behind the level of empirical reality is cultural reality and behind that is worldview."

Some of the futurists criticize the emphasized role of the western thinking in the world history in the cost of the other cultures (see for example Sardar, 2003a). Sardar (2003b) claimed that the western civilization consists of distorted imagination that is a false garbled perception of a reality. He (2003b:233) added that the distorted imagination is a coherent logic in the world of power relationships. "The global problem created by the distorted imagination is the way it silences mutual comprehension and communication." Ideally, futures thinking includes various cultural (multicultural) perspectives. The balance in this is important. Multiculturalism must not turn to anti-culturalism either (see Berger, 1998).

Cultural sensitivity helps to understand various ways of organizational futures learning and weak signals. In various cultures, different ways of learning can be appreciated and supported. For example, in some cultures, visual ways of presenting weak signals (the Futures Window) can be more acceptable than in cultures that trust more on textual information. Also, weak signals and their interpretations are different in various cultures. From the organizational point of view, favouring multicultural thinking will open eyes for more varieties in the futures.

2.3 Defining information, and concepts connected to it

In information perspective on organizational learning information, especially external to organization, plays a key role in learning and change. Information is closely connected to concepts like signals, data and knowledge. The purpose of this section is to go through basic definitions of these concepts in the literature.

Choo (2006) presented a connection of the concepts signals, information, data and knowledge. He (2006:131) commented that "Knowledge and information are the outcomes of human action that engage signs, signals, and artifacts in social and physical settings. Knowledge builds on accumulation of experience. Information depends on aggregation of data." Choo's view of the interconnection between signals, data, information and knowledge is presented in Figure 11.

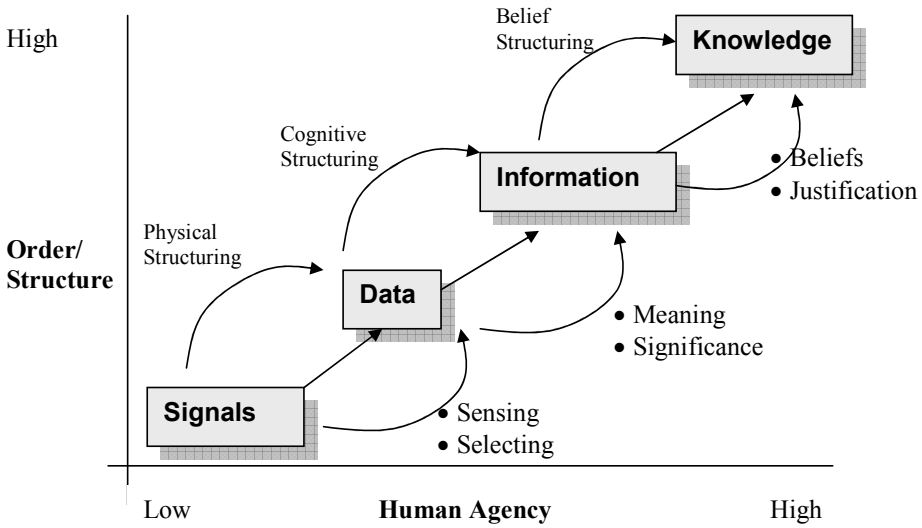

Figure 11. Data, information and knowledge (Source: Choo, 2006).

Choo (2006) suggested that signals (sights, sounds, and other sensory phenomena to which a human actor is exposed) are grouped or delimited into packets of data by physical structuring. Data are facts and messages observed by an individual or a group. The observer makes sense of perceived data by cognitive structuring, which assigns meaning and significance to the perceived facts and messages. For data to become information, mental models have to be constructed by individuals using words or images, or both, in order to represent data and their relationships in a convenient and accessible manner. This ensures

that viable interpretation may be composed and tested. Finally, information becomes knowledge when a human actor forms justifiable, true beliefs about the world (belief structuring) (Choo, 2006).

Nonaka & Takeuchi (1995) considered information to be a flow of messages, while knowledge is created by that very flow of information when it is anchored in the beliefs and commitments of its holder. For Sebeok (1999) a message is a sign or string of signs transmitted from a sign producer, or a source, to a sign receiver, or destination. This follows the traditional and widely cited theory described by Shannon (1948), which is presented in Figure 12.

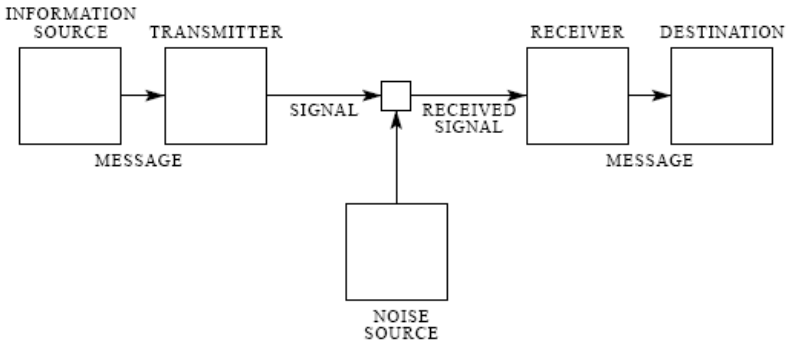

Figure 12. Schematic diagram of a general communication system (Source: Shannon, 1948).

According to Shannon (1948) an information source produces a message or sequences of messages to be communicated to the receiving terminal. A transmitter operates on the message in some way to produce a signal suitable for transmission over the channel. The channel is the medium (e.g. wires or a beam of light) used to transmit the signal. The receiver performs the inverse operation of that carried out by the transmitter, reconstructing the message from the signal. And finally, the destination is the person (or thing) for whom the message is intended.

While the Shannon's (1948) view of communication is simplistic and process oriented including the transmitter of the message, the channel and the receiver, communication includes much deeper levels that are not shown in Shannon's model. According to Stevensson (in Ihsan et al 1995: 900), "communication is the sharing of meaning and therefore understanding of it." He stated that meanings are socially constructed, based on our culture and experiences.

While Shannon's model focuses only on "technical" aspects of communication, it is important to notice that, for example, the transmitter can have his/her own motives and intentions in transmitting a message. The messages can include interpretations, deeper political purposes, assumptions of the world, burdens of cultural heritage, and even manipulation. On the other hand, the receiver interprets the message according to his/hers mental models, desires and needs. Sardar (1998:4) argued that "One sees what one wants to see: there is no universal truth". Seeing only what one wants to see is, of course, a burden with regard to looking at the changes in the future. Trying to question the impact of the worldview, culture, and motivations of individuals could help us to see the forthcoming changes and weak signals better. Again, CLA is a good tool for this.

Over the second half on the twentieth century, Shannon's views have developed into ideas that are important for knowledge and learning in organizations. For example, Nonaka & Takeuchi (1995:59) admitted that "in a strict sense, knowledge is created only by individuals. An organization cannot create knowledge without individuals. The organization supports creative individuals or provides contexts for them to create knowledge." According to Nonaka & Takeuchi (1995: 59), an organization's knowledge creation should be understood as "a process that 'organizationally' amplifies the knowledge created by individuals and crystallizes it as part of the knowledge network of the organization."

Ainamo, who studied the knowledge creation of Finnish consulting company, Jaakko Pöyry Group, found that "knowledge dominates at the end of a *longue durée*, while personalized exchange dominates at the beginning" (Ainamo, 2005:123-124). Ainamo emphasized the context of the information for knowledge creation process. He (2005:124) found that "expertise becomes true knowledge only when it is embedded within a given context, with the act of its transfer or transmission. Expertise is largely meaningless "raw data" without an ability to meaningfully contextualize it."

2.3.1 Perceiving and processing information

In this thesis, which is focused on future oriented information, and in particular on weak signals, it is also important to discuss perception and the processing of information. This is an area on which cognitive psychology focuses. This is particularly relevant to the discussion in the literature relating to perceiving images and provided insight for Article 5 i.e. testing images for disseminating weak signals in the organization using Futures Window. However, because it is not the focus of this thesis, this topic is covered more generally and superficially.

Balota & Marsh (2004:1) defined cognitive psychology as study of the behavior of knowing or thought. Kellogg (2002:4) stated that "Cognitive psychology refers to the study of human mental processes and their role in thinking, feeling, and behaving. Perception, memory, acquisition of knowledge and expertise, comprehension and production of language, problem solving, creativity, decision making, and reasoning are some of the board categories of such study." Eysenck & Keane (2005:1) defined that "It (i.e. cognitive psychology) is concerned with the internal processes involved in making sense of the environment, and deciding what action might be appropriate. These processes include attention, perception, learning, memory, language, problem solving, reasoning, and thinking."

Perception involves analysis of sensory information (Pike & Edgar, 2005). According to them (2005:73) ”When cognitive psychologists talk about perception, they are usually referring to the basic cognitive processes that analyse information from senses.” According to the cognitive perspective, information processing can be directed by senses or by internal models. Sense directed information processing is based on information that senses receive from the environment. It is processed in phases until a perception is built up; for example the perception of an object that one sees. This kind of information processing is called bottom-up or data-driven processing. Information processing driven by internal models is based on a person’s memory. Recognizing the target of the perception requires that there is a representation for that target in the memory. Individual contribution, like expectations determined by context and past experience, affect this processing. This kind of information processing is called a top-down or conceptually driven (for example Paavilainen et al., 2006 , Pike & Edgar, 2005, Eysenck & Keane, 2005, Hannus et al., 2005, Eysenck, 2001 & Näätänen et al., 1995). In visual perception according to the bottom-up school a perceived image is formed by building up of individual features of an image, while top-down approach suggests that the entire image is recognized first, and only then the individual features are filled in (Kelsey, 1997 & Hendee & Wells, 1997).

In our mind representations are organized into internal models i.e. schemas that include information about certain areas of life (Paavilainen et al., 2006 & Näätänen et al., 1995). Eysenck & Keane (2003:352) defined schema in a following way: “The term schema is used to refer to well integrated chunks of knowledge about words, events, people and actions.” Based on schemas we create expectations that affect the way a person perceives information and reacts to it (Paavilainen et al., 2006 & Näätänen et al., 1995). With reference to the ways that information is processed Gibson (1966) noted that the shorter the time to receive the information or the more inadequate the information, the less expectations, assumptions and views have time to affect the information. The short exposure time to weak visual signals is utilized in the Futures Window so that previous assumptions do not affect the perception of weak signals.

Neisser (1976) presented a perception cycle (see Figure 13), which describes perception as the interaction between schemas and the environment. Neisser's model integrates bottom-up and top-down views of perception (Chimir at el., 2006). In this model, organisms selectively sample available information in the environment according to their needs (Allen et al., 2004). Received information modifies schemas in order to be more equal to the object. Modified schemas affect how the observer later directs his or her attention (Näätänen et al., 1995 & Pitkänen, 2006). According to Chimir et al. (2006) Neisser's model indicates that the process of perception is determined by the current state of the environment and previous perceptual experience. From the organizational learning perspective this can mean that organizations (or people in it) only see the things that they expect to see. This can have grave consequences when it comes to acting on and reacting to changes in the environment.

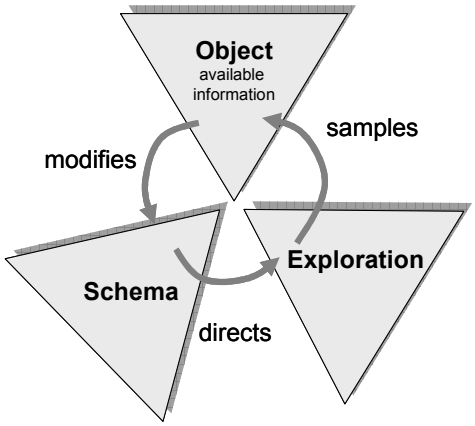

Figure 13. Neisser's (1976) perceptual cycle, where the schema directs exploration, which samples the object, which modifies the schema.

With regard to weak signals and information about possible future events the challenge of perception is to change some of the elements (schema, exploration or object) of the perception cycle in order to redirect people into taking better notice of weak signals. Training and education can change the dominant schemas towards the direct exploration of

weak signals. In addition, exposing people to weak signals (object) can serve to modify their schemas so that they are more open to various possibilities in the future. This is the aim of the Futures Window.

2.3.2 Attention as a prerequisite to perceiving information

A key concept in the perception of information is attention. To become aware of something (to perceive), a person first has to pay attention to it (Paavilainen et al., 2006). According to Mendelson (2001:127) "Attention…is the process whereby some incoming stimuli are selected for more complete processing." Belopolsky et al. (2008) commented that selective attention is a necessity to reduce the large amount of information for the visual system. This includes prioritization of information and ignoring irrelevant information. James (1890) distinguished between active and passive mode of attention. Attention is active, when controlled by the top-down way and passive, when controlled in the bottom-up way by external stimuli (Eysenck & Keane, 2005). A stimulus in the environment that is not anticipated or differs from our mental models, can draw the attention of a person whether she or he wants it or not (Paavilainen et al., 2006 & Vuorinen et al., 1994). This is labeled by Pavlov as "the orientation reflex" or what-is-it-reflex" (Turner, 1977 & Bandrés & Llavona, 2003). It is also referred to as the orienting response or investigating reaction (Näätänen, 1992). Pavlov (1927/2003:12) commented about the 'what-is-it? reflex': "It is this reflex which brings about the immediate response in man and animals to the slightest changes in the world around them, so that they immediately orientate their appropriate receptor organ in accordance with the perceptible quality in the agent brining about the change, making full investigation of it. The biological significance of this reflex is obvious."

With an orientation reflex an individual's action is interrupted and attention is focused on the new unanticipated stimulus (Paavilainen et al., 2006 & Vuorinen et al., 1994). Other

terms connected to this phenomenon are involuntary and passive attention (Näätänen, 1992). Besides passive attention, focused attention can also be voluntary, conscious and requiring exertion (Paavilainen et. al, 2006).

Näätänen (1992:6) described the changes from one different type of attention to another: "When attention is caught by stimulus from a task we are performing, it is usually almost instantaneously pulled back to the task performance (voluntary attention). The duration of passive attention to the stimulus, which caused the attention switch usually depends on the time needed for stimulus recognition and evaluation. However, when we start to follow a conversation whose onset initially caught our attention away from the task, it is a case where involuntary attention changes to voluntary attention without a concomitant change of the object of attention."

A feature that draws attention is that related to newness (the orientation reflex). Mendelson (2001:122) commented that "people do not monitor everything in the world equally. They especially want to know what is new or what is changing 'out there'." He continued that "unusual or unfamiliar objects have considerable potency for attracting attention". Mendelson (2001) found that novelty affects the way people maintain their attention. He also described that novelty has an effect on memory (Mendelson, 2001). With regard to this thesis novelty images (visual weak signals) in the Futures Window were expected to draw the attention of the people exposed to the tool. This is described in more detail in Article 5.

With regard to selective attention there are various paradigms that address the issue of how people select the information on which to focus. In focal attention studies subjects focus on a subset of the stimuli presented to them and ignore all of the other stimuli that are around. The debate in this issue is concentrated on so called bottle neck theories: in what part of the stream of processing the selection is performed -at the early or the late stage? Divided attention studies, on the other hand, focus on discovering how parallel tasks are performed. Here there are two general perspectives: firstly, performance in the dual task is generally

poorer, indicating that the cognitive system is limited. Secondly, people can, upon instruction, prefer one task over another in a semi-continuous fashion. This paradigm is reflected in limited resources theory; the idea that people have limited but flexible cognitive resources. There are several pools of resources for various tasks (Cohen, in press).

2.3.3 Visual perception and images as stimulus

Visual perception is one of our ways of perceiving the world around us. The tool for this is our eyes. Barry (1997:15) commented "Yet, what our eyes register is not a picture of the reality as it is. Rather our brains combine information from our eyes with data from our other senses, synthesize it, and draw on our past experience to give us a workable image of our world. This image orient us, allows us to comprehend our situation, and helps us to recognize significant factors within it."

Treisman & Kanwisher (1998:218) commented on the visual perception "The goal of perception is to account for systematic patterning of the retinal image, attributing features to their real world sources in objects and in the current viewing conditions. In order to achieve these representations, multiple sources of information are used, such as color, luminance, texture, relative size, dynamic cues from motions and transformations, and stereo depth; however the most important is usually shape." Visual perception both includes bottom-up processing, which is driven by stimulus, and top-down processing, which is related to the knowledge and expectations of the observer (Eysenck, 2001 & Serences & Yantis, 2006). However, according to Eysenck (2001) there are various theoretical views, like constructivist and direct theorist, with emphasis on the processing.

Visual environments include an abundance of information and thus a selection must be made in order to be able to interpret information from the environment. A stimulus that is different from the surrounding environment automatically draws attention (Näsänen, 2006). The acuity of vision is at its best in the center of the field of vision, the fovea (Pike &

Edgar, 2005*)*. At the edges of the field of vision accuracy is weaker. For this reason we tend to see only that, which is in our focused field of vision. However, the direction of sight is not necessarily equal to the attention of vision. It is also possible to focus attention to different parts of the field of vision (Paavilainen et al., 2006).

Key elements of the Futures Window (Article 5) are images of weak signals, i.e. visual stimuli. One purpose of this was to catch people's attention in order that they could see futures' possibilities. The power of images is reflected in the old saying: a picture is worth a thousand words. Pictures or images are also significant as means to drawing people's attention. The findings of Knobloch et al. (2003) supported the saying. These researchers noted that adding images to articles in an internet magazine increased the selection of those articles. Threatening images increased attention more than those that were more innocuous. Willis (2000) also supported this. He (2000, Internet) found that in web design "Significant effect for the use of enhancing visual elements was found in participants' immediate understanding of the message, aesthetic satisfaction of the site and memory retention over time."

Images are also faster to understand than a text. Biederman (1990:41-42) found that "In a 100-millisecond exposure of a novel scene, people can usually interpret its meaning…and recognize a pattern in a single glance." Näsänen (2006) found support for this by noting that compared to verbal information graphic information, icons and other graphical symbols can notably speed up and make easier the processing of visual information.

There are some features that influence attention to images. In sight there are mechanisms so called preattentive vision that automatically draw our attention to the stimulus that differs from the environment. Diverging stimulus "pop out" from the environment (Näsänen, 2006). There also exists a higher level of conscious searching for objects in the environments, which takes longer than preattentative processes (Leonards at al., 2000). Wolfe (1998) discussed in this sense about efficient and inefficient searches. Mendelson (2001:122) commented that "Unusual or unfamiliar objects have considerable potency for

attracting attention". For example big differences in light, darkness, size and angle can draw attention (Näsänen, 2006). Furthermore, screen size, regardless of content, can increase attention and arousal to a media (Reeves et al., 1999). Wanta & Roark (1993) found that recall of newspaper reports was enhanced by photographs, particularly by those that were laden with emotion. Similar results were reported by Zillmann et al. (2001) who concluded that the incorporation of agonistic images, in particular, was found to elevate attention to the text. Mendelson (2001) also found out that readers responded better to photographs that are novel, but only when the images are viewed on their own. These effects disappear when the photo is part of the newspaper page. Similar results were found in the Futures Window test and they are reported in Article 5.

Even though Näsänen (2006) pointed out that stimuli, that differs from the environment, draws attention automatically, there are some exceptions to this case. There is for example the potential for inattentional blindness by which even unexpected, salient objects are ignored. In this case the observers may be so focused on their simultaneous tasks that they ignore other things. Simons (2000:154) summarized that "Explicit attention capture by a new visual object simply does not occur in the real world. Unless subjects adopt an attentional set for the appearance of a new object or they are not focused on any other objects, events or locations, it is unlikely to capture attention exogenously".

Although there are clear benefits from including images in empirical research an examination of the literature shows that in strategy and future studies images have not adequately received the attention that is deserved. Because of the big potential that is offered by images this thesis tested how weak signals could be visually disseminated in organizations. The results of this study are discussed in more detail in Chapter 5.5.

2.4 Combining future studies and organizational learning- following the footsteps of Ansoff

Even though there are thinkers, like Molitor, who have had a great effect on weak signal thinking, Ansoff is highlighted in this chapter, because of his way to combine futures thinking, especially weak signals, and organizational learning, which are the grand disciplines of this thesis.

Ansoff's works are numerous. Throughout his career he has been an active writer [author and co-author of over 80 academic publications, including papers and books (Hussey, 1999)] focusing on various topics starting from the field of mathematics and physics and later focusing on the areas of strategy, organizations and management. Ansoff contributed to the discussion on foresight practices as early as the 1950's. In his article on diversification, he commented that "In addition to trends, long range planning must also take account of another class of events. These are certain environmental conditions which, if they occurred, would have recognizable effect on sales; however, their occurrences cannot be predicted with certainty- they may be called *contingent* (or catastrophic) events" (Ansoff, 1958: 396). It can be said that in that article Ansoff was discussing what is nowadays called wild cards, or discontinuities. Furthermore, in the paper Ansoff presented a figure (Ansoff, 1958: 397, Figure 3) that could be interpreted as sketches of scenario thinking. Ansoff's conclusion was that diversification is needed for companies to adapt environmental changes. From the 1970s much of Ansoff's published work concerned turbulent and discontinuous change, and connected for example weak signals and Weak Signal Issue Management System (Weak Signal SIM) to change. In particular, he emphasized that the various environmental turbulence levels leads to needs for various strategies (Hussey, 1999). Ansoff also focused on writing about the future challenges faced by organizations and managers (see for example Ansoff & Brandenburg, 1969 & Ansoff, 1984). For example in the paper "The General Manager of the Future" (Ansoff & Brandenburg, 1969) four important changes that shape the firm of the future were presented. These changes were: 1) boarder institutional perspectives, 2) the information

explosion, 3) the need to manage the firm as a behavioral system, and 4) the acceleration of the pace of business change. In this article they commented that "The innovative firm of the future is people-intensive firm, which depends more than ever on human imagination, creativity and initiative" (Ansoff & Brandenburg, 1969: 67). These early writings on change are certainly current to the challenges of today.

From an organization theory perspective Ansoff has contributed to the strategy-making process and the implanting of strategy inside the organization. He introduced the concept of strategic management in his paper in Journal of Business Policy, 1972 (Hussey, 1999), and discussed the issues introduced in this article more thoroughly dealt in his book Implanting Strategic Management (Ansoff, 1984). Ansoff had wide experience of management; he was a manager, teacher (professor) and consultant (Ansoff, 1984) and thus had real knowledge of the challenges of implementing strategy inside an organization. He was also therefore in the position where he was able to discuss organizational resistance to change and the filtering of information.

Ansoff (1977) also examined, from a historical perspective, the evolution of management systems, particularly dynamic systems in USA, and especially focused on the effect of environmental conditions (such as turbulence) to system evolution. A further field of interest was that of the organizational flow of planning from the point of views of centralized and decentralized decision-making, and the challenges of introducing planning systems to an organization (Ansoff, 1977). Ansoff (1987) presented an emerging paradigm for strategic management of the firm in order to legitimate the various theories that consider this theme. He developed the paradigmic cube in which organizational behavior is described by three dimensions: the problem dimension - internal and external-, the process dimension, and the rationality dimension - or scientific optic (Ansoff, 1987). Ansoff underlined that the strategic behavior of the firm is influenced by the environment of the company and its internal capabilities by saying that "Strategic evolution of an organization is determined by a three-way feedback interaction between forces of the environment, the

internal configuration and dynamics of the organization, and its strategy" (Ansoff, 1987:514).

In his works Ansoff offered practical step-by-step advice to managers for various functions - for example for strategic thinking and implementation. Ansoff's background in mathematics and physics (Hussley, 1999) is seen throughout his work; detailed mathematical formulas or fastidious diagrams are present in many of his works. Despite this scientific background he also presents extensive views of organizations and their behavior.

In summary, it can be said that Ansoff was interested in change and the challenges of change with respect to organizations and their strategy. He also emphasized the use of weak signals in the strategy process. Thus, in terms of this study Ansoff's views are the link between the two major themes of this thesis: futures studies (the main emphasis of this study) and organization theory (a secondary emphasis of this study). As has been described, one of the purposes of this thesis is to connect weak signals to organizations' futures learning process. With regard to that challenge, Ansoff provides valuable theoretical ground. In Figure 14 Ansoff's connection to the two major themes of this thesis is presented.

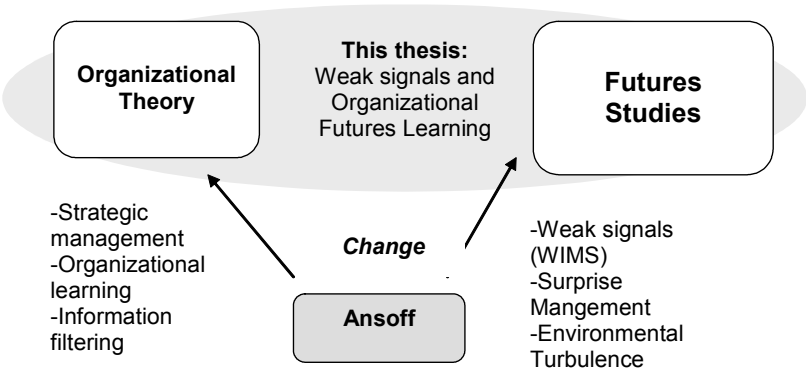

Figure 14. **Ansoff as a link of organization theory and futures studies that are the grand disciplines of this thesis.**

2.5 Early notions of weak signals and emerging issues

Igor Ansoff and Graham T.T. Molitor could be named as grand pioneers in weak signal and emerging issue thinking. They both published their works on the topics as early as 1970's. Ansoff's role in the weak signals discussion is undisputed not only because he was the first to combine weak signals to strategic thinking, but also because the volume of material he has produced on the topic is considerable. Molitor, on the other hand, is a well known futurist, who lifted the other side of the weak signal thinking, emerging issue analysis, in his works about public policy change. (Molitor 1977, 1981& 2003).

Ansoff started the discussion of weak signals as early as the 1970s in his article: Managing Strategic Surprise by Response to Weak Signals (Ansoff 1975). He related weak signals closely to organizational issues such as environmental turbulence and strategy formulation.

In contrast to conventional strategic planning, which is based on acting on strong signals, Ansoff (1975) suggested firms use graduated responses through amplification and response to weak signals. Ansoff (1975, 1984, 1985) discussed about Strategic Issue Management Systems (SIMS) and Weak Signal SIM, which he preferred to complement a conventional strategic planning in rapid changing i.e. turbulent environment. Ansoff (1982:12) defined weak signals as "warnings (external or internal), events and developments which are still too incomplete to permit an accurate estimation of their impact and/or to determine their full-fledged responses". Ansoff (1982:13) clarified that "Weak signals can be detected early in the life of discontinuity. But they are useful only if the firm responds to them with low cost measures, which progressively commit the firm, keeping options flexible until the signal become strong". This is linked to the paradox of the timing of using information. Ansoff (1975: 23) pointed out that "If the firm waits until information is adequate for strategic planning, it will be increasingly surprised by crises; if it accepts vague information, the content will not be specific enough for thorough strategic planning". For this purpose, Ansoff (1982, 1985) presented a matrix that linked the signal strength and graduate response of a company (see Figure 15). Although this matrix is complex and difficult to use in practice (for example the difficulty of labeling the strength of the signal) the message is practical: weak signals should not be reacted immediately- they should first be monitored and gradually, as the issue evolves, more should be committed to it.

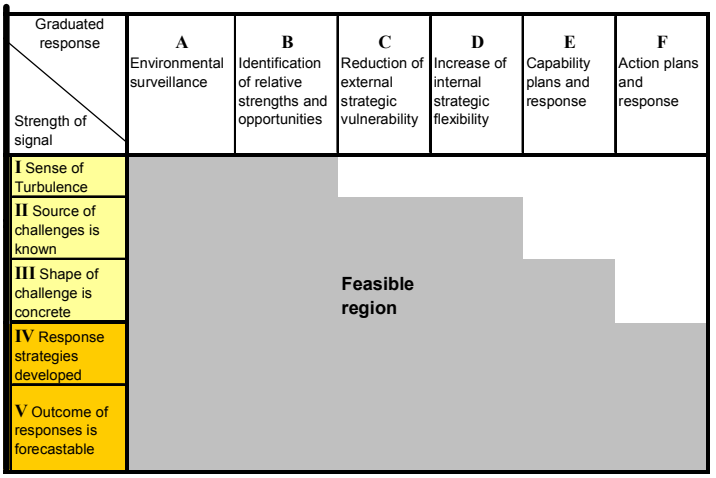

Figure 15. Weak signals and graduated response (Source: Ansoff, 1982, 1985: 12).

A further issue of relevance is Ansoff's theory of information filtering (see Figure 16). In this theory he suggested that, prior to triggering action, information goes through three filters: a surveillance filter, a mentality filter, and a power filter (Ansoff, 1984). He described environmental surveillance and analysis techniques to be the first filter for information to pass through on its way to an organization (surveillance filter). He emphasized that the improper choice of environmental scanning techniques can make the firm strategically short-sighted (Ansoff, 1984). The mentality filter is connected to the receiver's mindset and their past experiences, while the power filter was decscribed by Ansoff (1984:335) the following way: "If the powerful managers lack the appropriate mentality, they will persist in preventing vital novel signals from affecting decisions." .

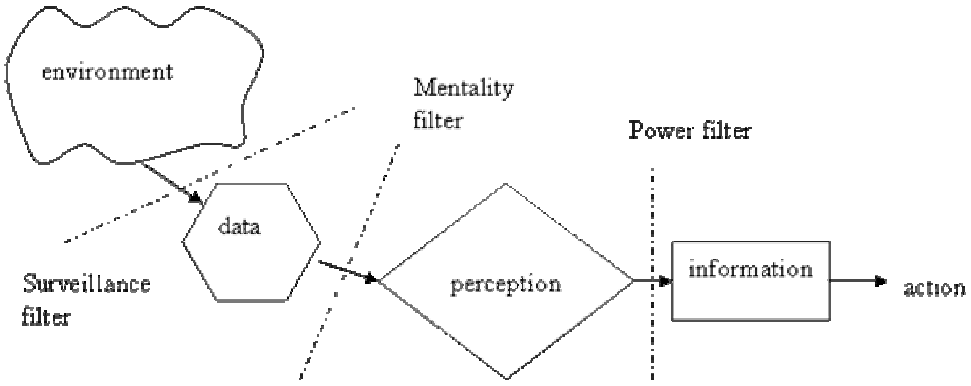

Figure 16. Information filtering (source: Ansoff, 1984:335).

Ansoff's information filtering theory gives valuable insights to organizational futures learning. It describes the obstacles (filters) for accessing new information (including weak signals), which is a prerequisite for futures learning. A challenge from the organizational futures learning perspective is the narrowness of the information filters. This can be changes by widening the filters: the surveillance filter by using various sources for information, the mentality filter by selecting people from various backgrounds in the company, and the power filter by innovating flexible strategies that do not threaten people's position in the organization. Article 4 attempts to widen the surveillance filter of organization by providing hints for sources of information.

While Ansoff's models and definitions of weak signals have been much cited, particularly by Finnish researchers criticisms can also be applied. Nikander (2002:41) criticized that Ansoff does not present a research basis for his ideas. Rossel (2007) questioned Ansoff's views of weak signals, which he suggested being based on Shannon and Weaver's (1948) theory of information. Rossel (2007:2) commented that beneath the discussion of weak signals there is a hidden assumption, which is never really discussed: "Weak signal theory seems to be supported by the idea that 'something' (almost someone), expressing early manifestations of changing realities, is sending us messages for us to interpret and react in

timely manner." Minzberg et al.(1998), on the other hand, passed judgment on the Planning School, in which Ansoff's ideas of strategy are categorized - and stated that this was a too formal and mechanistic view of the strategy process. Despite these critiques of Ansoff's views about weak signals, and his visions of how to use weak signals in strategic planning in practice, there is no denial that his ideas have had influence on the study of weak signals, especially in Finland.

Molitor has more holistically focused on the change process, especially in the public policy changes, and examined the phases and precursors of change. Even though he does not use the precise word combination "weak signals" as such, weak signal thinking can be seen in his works, via first phases of evolutionary process of change. Commenting on this process, Molitor (2003:63) has indicated the importance of many actors in the change process and the challenges of the emerging issues: "The genesis of change originates in creative minds. Merely conceiving innovative ideas is not enough. Concepts must be put forward and nurtured" (ibid.).

According to Molitor (1998: Internet source): " The future is part of a seamless continuum and emerges from roots deep in the past." This sentence summarizes the idea behind his forecasting model well. Molitor (1977) argued that, as public policy changes take time to happen, it is possible to anticipate them years in advance. As he put it (1981: Internet Source): "Changes in public policy seldom come as a bolt out of the blue. Changes evolve." He argued changes in legislation would evolve as a result of social friction which exposes abuses or wrongs (Molitor, 1981). Then it is time for government response. Molitor (1977) described the changes in public policy issues by S-curve, where the change at first slowly takes off, then rises steeply, and finally tapers off. Molitor (1981: Internet source) pointed out that "The process invariably begins with aberrant and unique events. Novel or bizarre, at first, such happenings go largely unnoticed. Their accumulation over time eventually leads to aggregation which helps to reveal meaningful patterns. Event patterns emerge in many different ways. Among them: innovation from introduction of new technologies and social inventions, increases in magnitude, and practical experience. As events unfold and

become the object of attention various authorities and advocates (often the “victimized”) observe, analyze and begin to comment on such emerging phenomena. Authorities include the gifted few who can be found in any discipline and the geniuses who propose a theory which may take years to prove. ”

Molitor (1981) described the process of change by involving/including of leading events, leading authorities/advocates, leading literature, leading organizations, and implementation by leading political jurisdictions (domestic precursors and leading nation-states). By scanning these emerging issues, it might be easier to anticipate future changes. Figure 17 presents Molitor’s views of building data or evidentiary base for public policy changes, and Figure 18 shows the discovery of a new issue to the acceptance of a new phenomena by Molitor (2003).

Figure 17. Building data or evidentiary base by Molitor, 2003.

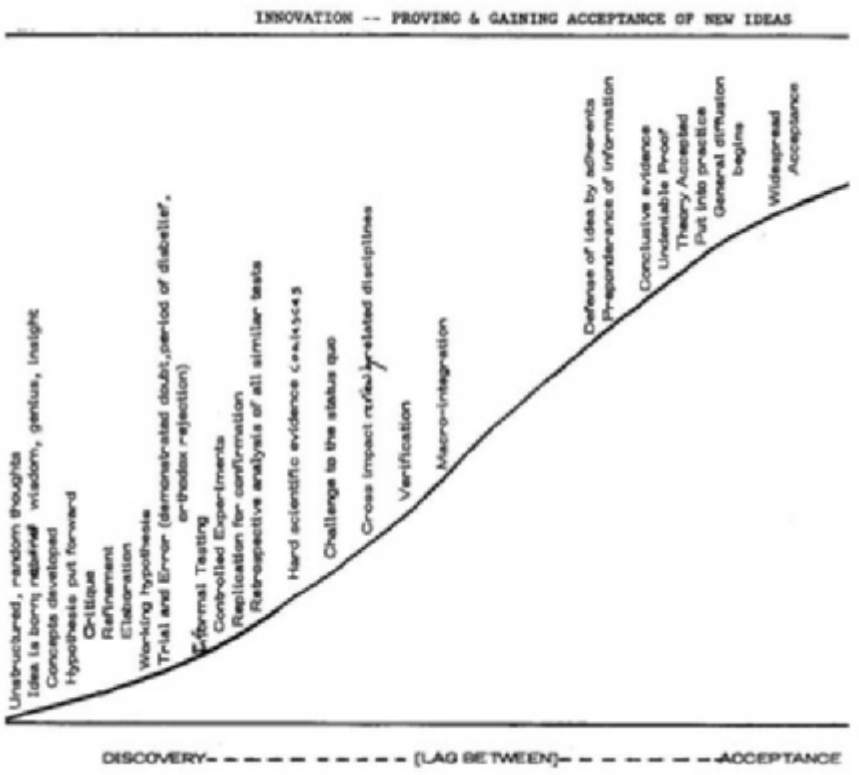

Figure 18. From discovery of a new issue to acceptance of a new phenomena (Molitor, 2003)

According to Lang (Internet source), Molitor divided the development of issues into three stages:

1) The Framing of the Issues: The ideas are generated by experts or innovators and they appear as unique and odd bits of insight in alternative information sources like the fringe media. These ideas lead to a practical manifestation in the form of innovation which creates certain events and their possible social impacts turn the innovation into an issue.

2) The Advancement of the Issues: Change agents (for example, victims, crusaders, think tanks, academia, advocates and the like) elaborate on the explanation of the issue that in

succession gets the more mainstream media interested in it. Groups then form to address the issue that shapes the public discussion and mood and accelerate the move for change. This is the point of no return for the issue and implementation of a solution is said to be near.

3) Resolving the Issues: The resolution of an issue is now considered near and can take a variety of forms. They range from informal solutions to litigation, to voluntary accommodation to quasi government settlements to a legislative response and then to implementation and execution. By the time the issue is resolved, the public has reached the saturation point and therefore interest wanes.

2.5.1 Other discussion about weak signals in the literature

In addition to Ansoff and Molitor, Coffman (1997a-e) has been a major contributor to weak signals research and has discussed the different aspects of weak signals. His five part series of articles was published by the McTaylor Consulting group's Internet journal, 1997. Although Ansoff concentrated on weak signals as a part of strategy work, Coffman focused on dealing with the characteristics of weak signals by combining various theories in the field of information, cybernetics, complexity and self-organizing. In addition, he related weak signals to the business environment and as an asset for a corporation to anticipate change, and further gave some practical ideas on how to utilize weak signals.

Coffman (1997a) defined weak signals as: “

1. *an idea or trend that will affect how we do business, what business we do, and the environment in which we will work*
2. *new and surprising from the signals receiver's vantage point*
3. *sometimes difficult to track down amid other noise and signals*
4. *a threat or opportunity to organization*
5. *often scoffed at by other people who "know"*
6. *usually has substantial lag time before it will mature and become mainstream*
7. *therefore represents an opportunity to learn, grow and evolve*.”

Coffman (1997b) classified three other types of weak signals: 1) signals that are beyond our perception 2) signals within our perception but unrecognized by our mental models and 3) signals recognized by our mental models that we use to modify our behavior. He (1997a) made concrete his ideas regarding weak signals in the following way: “*something just feels funny”*, “ *...this is confirmed only by a hunch…”, “… stray pieces of data call attention to themselves”,” ...hard to predict ideas long before they reach mainstream recognition…”,” some particular idea or a set of half-conceived ideas are hanging around the periphery of our comprehension…”,” something different happening and we cannot quite pin it down…”*

Since the works of Ansoff, Molitor and Coffman, the notion of weak signals and emerging issues have received greater attention in the strategy and futures literature – particularly as a tool for anticipating future change. However, the discussion is more focused on the “consultant” type of argumentation; for example how weak signals could be utilized for strategy work. Even though these views are very important and valuable, there is a lack of a more theoretical view of weak signals. For example there is little on the definition and the characteristics of the concept and the connection between weak signals and possible change. Furthermore, there are some concepts, like emerging issues, seeds of change, wild cards and early warning signals that are used as synonyms for weak signals. This mismatch

of definitions and characteristics complicates the understanding of weak signals; how can managers use them in strategic foresight process if they do not know what they are in the first place. Clarifying the fuzzy concept will assist in understanding weak signals, their features and their relationship to change.

As related above, the discussion of the definition of weak signals has been raised in recent years, particularly among researchers in Finland. The confusion concerning definition of weak signals and other related concepts has been raised by Kuusi et al. (2000) and Moijanen (2003). In addition to the issue of definition, some of the key questions in this debate have been a concern if weak signals are simply signs of emerging issue or are they emerging issues themselves, and the question of whether the same signal can be a weak to one actor and strong to another actor. This conversation has been a spark for the conceptual articles of this thesis, and the discussion can be found from the Appendices 1-4. The Appendices include the discussion of weak signals by Finnish futurists (Appendix 1), and the discussion of the characteristics of weak signals (Appendix 2, Appendix 3 and Appendix 4).

2.5.2 Towards understanding weak signals in organizational environments

From the point of view of organizations it is not the definition of the weak signals that is the principal interest, but the question of how to best utilize them in the organizational environment, and particularly in organizational futures learning. Coffman (1997d) linked weak signals in high risks but also a possibility for greater opportunities (Figure 2).

Coffman (1997d) commented that “Investment in weak signals before they become mainstream is risky but includes the greater potential rewards”. According to this author it is important to look for weak signals, because they provide an opportunity to prepare for change. He stated that “If an enterprise identifies weak signals early on, it may always choose whether or not to execute a strategy to promote and invest in them. If the enterprise,

through some quirk of its structure and processes cannot or will not identify weak signals, then it can only fall prey to whatever comes along. It's like flying a jet without radar" (Coffman, 1997d).

There are some tools for estimating and collecting weak signals in organizations. For example, Ansoff (1984) presented a Weak Signal Issue Management System (Weak Signal SIM), which adds an important option to the "strong signal management system": a strategic learning or gradual commitment option in which the firm responds, step by step, as the issue progresses to higher states of knowledge. Although Ansoff's concept of Weak Signal SIM is designed to suit the company environment, the practical use of it appears to be very mechanistic. There is no space for creativity and intuition and there is a risk of "not seeing the forest for the trees". In addition, Ansoff does not present any practical cases of WIMS in use; it appears to be only a conceptual idea of how weak signals could be used in organizations. Ansoff's weak signal SIM is illustrated in Figure 19.

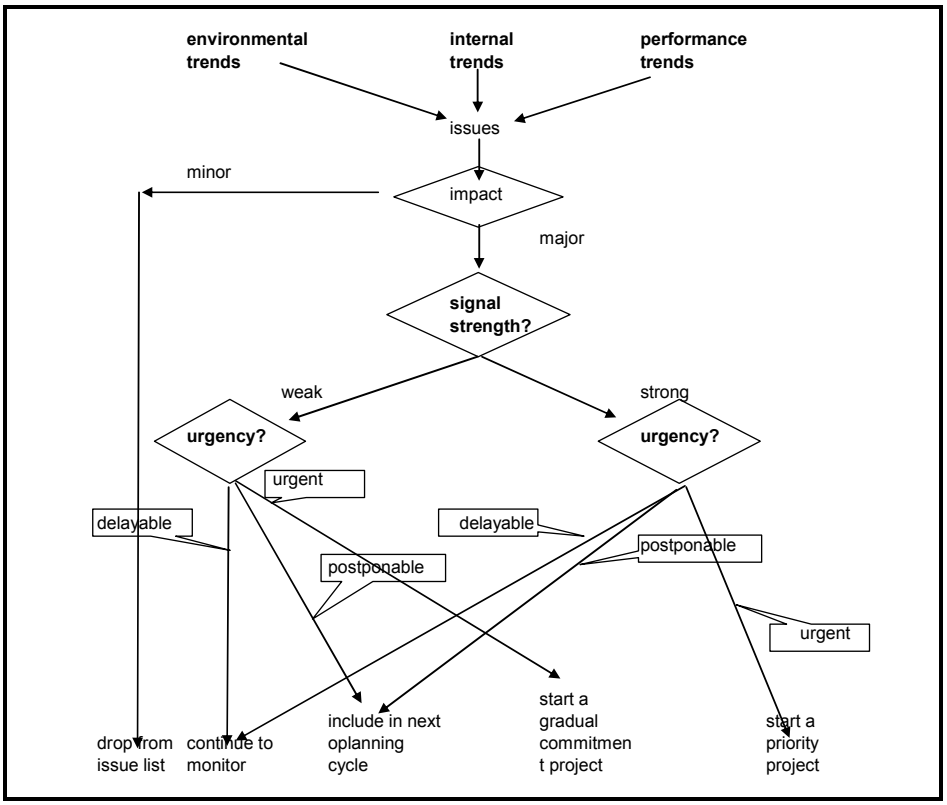

Figure 19. Priority assignment in Weak Signal SIM (Source: Ansoff, 1984: 366).

There is also commercial software for collecting and analyzing weak signals. This is particularly the case in Finland, where the interest in weak signals has led to the development of these kinds of software (see www.trendwiki.fi[5] and www.strategysignals.com).

[5] I have co-created the TrendWiki tool for organizational collecting and analyzing of weak signals with the Finnish data analyzing company Data Rangers Oy, www.datarangers.fi. This tool is currently owned by Data Rangers.

2.5.3 Recombination: Towards weak signals in organizational futures learning

As previously stated, organization theory, particularly the organizational learning perspective, has not been actively linked with futures studies and weak signals since Ansoff's early attempts. One aim of this thesis is to follow Ansoff's footsteps and to create a link between of these organization theory and futures studies. Inspired by Ansoff's work in combining various disciplines, particularly foresight and organization theory, a new tool for organizational futures learning is presented in this thesis. In addition some aspects of organizational learning, such as knowledge acquisition are explored in the thesis.

Combined the various theories of organizational learning and change, it can be concluded that, at the individual level, learning occurs when mental models are changed by consequences of actions that are contrary to our existing beliefs. In the organizational context individuals are the ones that are exposed to weak signals in the environment (outside or inside of the organization). Weak signals can be spotted by individuals who are spurred by unexpected consequences (learning), or as a result of redirecting information seeking (see Neisser's perception cycle). Disseminating weak signals, and analyzing the conclusions relating to future change based on these signals, can be encouraged by providing frames inside an organization for spurring social interaction and knowledge creation. From the organizational renewal point of view involving high level managers in the process is essential. In the next section two hypothetical cases of how organizations could use weak signals in their processes are presented.

3 Two hypothetical cases of using weak signals inside organizations

Although this thesis principally concerns the theory of organizational learning and futures studies, the empirical studies do not give direct guidance to organizations on how to operate with weak signals. It is beyond the scope of the study. However, based on the learning experienced through the examination of the literature, by writing the thesis and by directly working with organizations it is possible to present two hypothetical cases of how organizations can use weak signals in their strategy-making and learning processes. The cases provide contrast: in one, the preferred case (Case 1) a situation where weak signals are collected and shared openly and all members of the organization participate in the process in described. The second case (Case 2) describes a condition where "weak signals" are collected only by managers in order to legitimize their decision-making, see Table 4.

Table 4. Two hypothetical cases of using weak signals in organization

	Case 1	**Case 2**
What are weak signals?	Observations of new issues that emerge	Management visions of what might happen in the future
Who collects signals?	All the employees + stakeholders	Management
How are signals collected?	Continuously	Ad hoc – related to strategy sessions (otherwise not collected)
Who analyzes signals?	All employees, Foresight unit focusing on anticipating the changes	Management
Purpose to collect and analyze signals	To question current the belief system	To legitimize decisions
Disseminating signals	All organization levels (signals are openly disseminated)	Management (signals are top secret)
Tools	Yes	No
Focus area	Wide and open	Focused on their own industry
Motto	"Tell us the freakiest thing you can find - it can be something relevant for us in the future"	"Information overflow is a big problem" "You cannot see the future anyway, so why bother in the first place?"

3.1 Case 1: Open use of signals inside an organization

In this case collecting weak signals is the responsibility of every employee in the organization. Looking for potential future changes is made as much an essential part of every one's job as it is to fill in work timesheets or monthly report. Every employee is taught to observe weak signals as soon as he/she enters the organization, and it is

emphasized that observing the changes is a continuous process, and essential to the organization. It is also emphasized that it is important to look behind the signals of the emerging issues in order to avoid overreacting or underestimating those emerging issues. Furthermore, it is understood, that every employee and the whole organization can affect the turn of events by their own actions.

There are a number of tools for the easy collection of signals. For example employees are provided with camera mobile phones with which they can take images of new issues in the world and send them to the organizational weak signal database. In addition, tools that make it possible to disseminate and analyze weak signals are available to the organization and they employ ideas of social media and democracy; i.e. every employee can contribute to analyzing (and distributing) weak signals. Furthermore the broad range of stakeholders, including customers, are challenged to send their observations about new issues that they perceive to be sprouting in the world and that might be relevant for the company. Motivating employees to collect weak signals is understood to be an essential part of the organization's capability to see future changes. Collecting weak signals and participating in the discussion about future possibilities is made fun and interesting and by paying attention to this the organization motivates its stakeholders and customers to be part of potential future change.

The organization is not afraid of information overload that might come from collecting weak signals; it considers this as an asset in order to try to make sense of the forthcoming changes. Because the tools can deal with large volumes of information and make sense of this information, the more weak signals that are obtained the better. For example text mining tools are used to show patterns of change in the raw data and to highlight new issues. There is a foresight unit in the organization whose task is to focus on analyzing the weak signal material and make scenarios based on these signals. In addition all employees can participate in analyzing the data, for example by using wiki-based software platforms. The scenarios that are based on the weak signal analysis are widely distributed inside of the

organization; this opens employees' mental models about changes in the future and inspires them about creating the future (See Figure 20).

Figure 20. Utilizing weak signals effectively inside an organization.

In this case weak signals are considered to be an inspiration for employees to think about future changes as well as to innovate futures. This is the reason why they are not considered as secret information that is restricted to a limited number of units inside the organization. One purpose of exposing employees to weak signals is to make them continuously question their/and organization's current belief system.

3.2 Case 2: Using weak signals to legitimize management decisions

Weak signals, which are considered as visions of the future, are used by the management level of the organization for decision-making. These "weak signals" are collected from the managers just prior to the strategy sessions, with no special tool utilized, and then used as a basis for strategy processes in the organizations. This means that analysis of the signals is undertaken by the management team that is responsible for the strategy process. Weak signals are only relate to the industry the company works in, they do not focus on other areas of life, because they are not considered as relevant from the company point of view. "Weak signals" or visions of the future are used more to legitimize the decision of the management in their strategy process rather than to question the manager's current belief system. "Weak signals" are considered as secret and thus not disseminated through the organization. They remain part the management's obligation and employees are not informed about them.

In this case weak signals, as they are understood in this thesis, are not collected because this kind of information is not considered as relevant to the organization. Furthermore, there is a fear of too much information creating an overflow.

3.3 Conclusions of the cases

The first hypothetical case described a positive and open attitude towards weak signals, whereas the second case described a situation where weak signals are used as tools for legitimizing the strategic decisions made by the organization's management elite. From personal experience working as consultant in various organizations, the use of weak signals in 'the real world' rather unfortunately, follows the pattern of the second case; this is frequently unbeknown to the managers. In some organizations it remains the case that weak signals are not used at all inside that organization.

The open use of weak signals would require a tool for collecting and analyzing such signals. Furthermore, because weak signals provide means for anticipating and innovating future changes, the importance of these signals needs to be emphasizes inside organizations. Tools, based on social media, for example community tagging and sharing, are recommended to be used inside organization in order that they can properly attend to weak signals.

4 Conclusions of the theory part

The theory part of this thesis dealt with various aspects of organizational futures learning and weak signals (see Figure 21) by undertaking an extensive literature research. Firstly, strategy and tools for strategic foresight were discussed, then various theories on organizational learning and change were assessed. From the point of view of weak signals, definitions for signals and concepts related to it like information and knowledge were assessed. Also theories of processing information from the perspective of cognitive psychology were dealt with in this chapter. However, because not being a focus of this thesis, this discussion was more superficial. The main emphasis of this thesis was on combining the views of organizational learning and weak signals, in which the theoretical views of Ansoff (e.g. 1984) and Molitor (e.g. 1977) were seen as essential. Also views of various futurists on weak signals and wild cards were discussed .

Figure 21. Theoretical perspectives of this thesis from the point of view of organizational futures learning (OFL).

5 Summaries of the articles

This chapter provides a summary of the five articles that are presented in this thesis. The first three articles focus on the theoretical discussion of weak signals. The articles include an examination of the weak signal and wild card discussion and provide a new definition of the concept weak signal at a new meta-level; the future sign. This study provides clarification of the relationship of weak signals and change in the signification process, too. The first three articles bring contribution to the discipline of futures studies and discussion of weak signals, emerging issues and change process, which has had some blurriness before. They clarify the relationship and interconnections of all of these elements and provide a new view of thinking weak signals, emerging issues and their connection to change. Out of the five articles the article number 2, and related to that article number 3, which is further refining the future sign concept, could be called the major outcomes of this thesis. They bring new views for weak signal thinking and add semiotic thinking to futures studies discipline.

From organizational perspective it is not the definition of weak signal that is important but the use of them in organizational context. The last two articles discuss using weak signals from various view points for organizational purposes and give some practical suggestions to organizations concerning utilizing weak signals in their futures learning. There has been some discussion before regarding the use of weak signals in organizational purposes, but articles 4 and 5 add some more to this discussion; article 4 gives some “best-practice” views of scanning the weak signals and article 5 provides a new tool for using and disseminating weak signals in organizational contexts.

5.1 Article 1: Was It a Wild Card or just our Blindness to Gradual Change?

As seen from the literature review in Chapter 2, there appears to be confusion about the definition of the term weak signal. One of the major sources of the confusion initiates from the fact that the term is sometimes used as synonym for the expression wild card (see Mannermaa, 1999a), or that weak signals are defined to resemble the characteristics of wild cards (see Harris & Zeisler, 2002). In addition, there appears to be confusion about the definition of the term wild card, particularly when it comes to practical examples. This article aimed to clarify the two concepts: wild cards and weak signals and shed light on the differences and the relationships of these terms. This article also focused on understanding different kinds of changes.

5.1.1 Background of the article

This article examined several authors' definitions of the term wild card and revealed some similarities and differences between the definitions. For example, wild cards have been defined by Rockfellow (1994:14) as "an event having a low probability of occurrence, but an inordinately high impact if it does." Petersen (1999:4), on the other hand suggested that wild cards are "low-probability, hi-impact events that happen quickly" and "they have huge sweeping consequences." According to Cornish (2003) a wild card is a surprising, startling event that has important consequences. Mendonça et al. (2004:201) defined wild cards as "sudden and unique incidents that can constitute turning points in the evolution of a certain trend." They continued that a wild card is assumed to be improbable, but it would have large and immediate consequences for organizational stakeholders if it were to take place. Mannermaa (1999a) used the term wild card as a synonym for weak signal. He defined wild cards or weak signals as issues that are sprouting and do not have a history, trend or other recognizable past, but that can in the future become central phenomena or influential

factors. To summarize the literature examined in the article, wild cards are typically considered to be surprising (low-probability) and hi-impact events.

Although there appears to be only slight differences of how wild cards are defined, there is some fuzziness about the concept. Some differences in the definition of wild cards for example concern its duration. Furthermore the probability of its occurrence also raises some questions. The fuzziness of wild cards can particularly be seen in the different authors' presentation of practical examples. In the article, examples of wild cards, mentioned in previous studies, were examined and were recategorized by reference to change (see Table 5). As it can be observed in Table 5, most of the events that authors have called wild cards are more akin to gradual type of change.

Table 5. Practical examples of wild cards in the previous literature and recategoratization of them to gradual changes and wild cards

Wild card listed by authors	Possible wild card/ history wild card	Author	Type of the wild card WC=wild card GC=gradual change
Hong Kong rules China	P	Rockfellow (1994)	GC
Europe goes regional	P	Rockfellow (1994)	GC
Leap from horse to car	H	Rockfellow (1994)	GC
Leap from typewriter to computer	H	Rockfellow (1994)	GC
A hurricane devastating a town	P/H	Petersen (1999)	WC
Shift of Earth's axis	P	Petersen (1999)	WC/GC
Asteroid or comet hits the earth	P	Petersen (1999)	WC
Gulf or jet stream shifts location permanently	P	Petersen (1999)	GC/WC
Crashes of WTC tower, 9/11	H	Cornish (2003), Mendonça et al. (2004)	WC
The fall of Berlin Wall (the reunion of Germany)	H	Mendonça et al.(2004)	WC/GC
Major stock market financial crash	P/H	Mendonça et al.(2004)	WC
Thermal depolymerization (everything into oil)	P	Futurist.com	GC
Doubling the life span	P	Futurist.com	GC
The rights of robots	P	Mannermaa (1999a)	GC/WC
A global multimedia monopoly	P	Mannermaa (1999a)	GC

5.1.2 Outcomes of the article

This article examined the different definitions of the term wild card in the literature. Most often a wild card is defined as a surprising event that has significant consequences. In the literature the examples labeled as wild cards do not always meet this definition. In the article some examples of wild cards were divided into two categories according to the rapidity of the change taking place: wild cards and gradual changes. By looking at the examples of wild cards in the literature, it was found that a large proportion are actually gradual changes. This examination appears to suggest that some of the wild cards listed by the authors are not, in fact, that surprising. On the contrary, they are more gradual changes, which could have been/could be anticipated well in advance.

This article concludes that the most important characteristic of wild card type of changes is their rapidity. This makes them difficult to anticipate by using weak signals and thus wild cards are a surprise to us.

The article provides some insights into the differences between wild cards and weak signals; this helps the concepts to be distinguished from each other (see Figure 22).

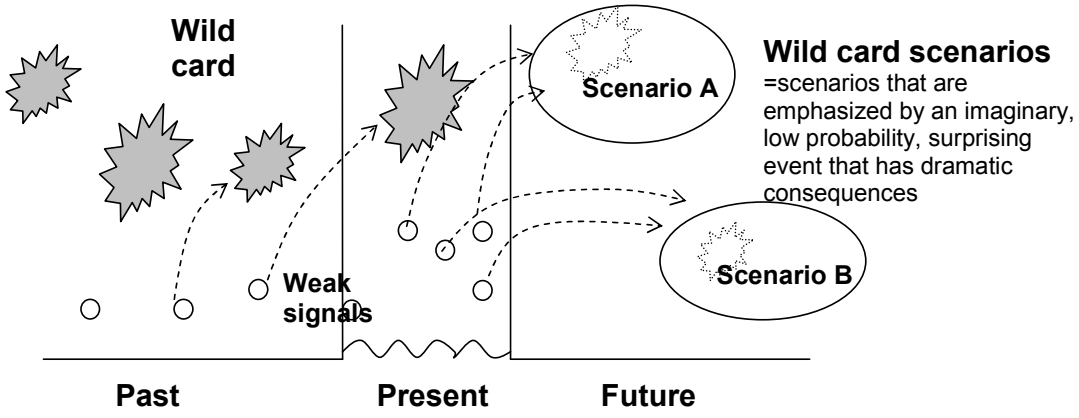

Figure 22. Wild cards and weak signals in the time frame.

Figure 22 illustrates that weak signals are current, small and seemingly insignificant signals of issues and events that can tell us about changes in the future. In other words, they are today's clues and signs that provide us with hints of possible future events and trends. With hindsight, weak signals have provided hints about future events in the past. By contrast, wild cards are surprising events with huge consequences. They have either occurred in the past or are occurring at the moment. With regard to the future, it would appear to make sense to talk about "wild card scenarios" rather than simply "wild cards"; they are scenarios that are dominated by imaginary and are sudden events that have dramatic consequences.

From the academic perspective it is clearly important to clarify concepts used in the literature. Confusion about concepts can lead to misleading interpretations of related phenomena. The aim of this article was to clarify the meaning of wild cards, and particularly the way it is different from weak signals. A further purpose was also to underline the connection of the wild cards and weak signals. By detecting and analyzing

weak signals it is possible to anticipate and react to large, substantial and fast changes, which otherwise could damage an organization or people. For example, after the tsunami (wild card) in Asia in December 2004, weak signal monitoring systems [Tsunami Warning systems; see for example: Envirtech http://www.envirtech.org] have been developed in order to prepare for, and include timely reactions, to future tsunamis.

5.2 Article 2: The Future Sign and its Three Dimensions.

The aim of this article was to produce a meta-level perspective of weak signals that would overcome the key problems of definition that have appeared in previous literature. As discussed in Chapter 2 until now there has been ambiguity about the concept of weak signal. There are parallel concepts and terms, such as emerging issues, wild cards, seeds of change, early warning signals that are frequently employed when discussing the same ideas that are referred to as weak signals. Furthermore, there are many ways to define weak signals. Sometimes these include the emerging issue itself, and sometimes they are simply defined as signals of emerging issue. Moijanen (2003) in particular discussed dilemmas around definition and this article aims to address this issue.

5.2.1 Background of the article

This article explores various views concerning weak signals. It commences with Ansoff (1975), who was one of the first authors to write about weak signals. The article examines the literature of other key contributors including, but not limited to, Coffman (1997a-e), Harris & Zeisler (2002) & Day & Schoemaker (2005, 2006). The discussion concerning weak signals has been active, particularly in Finland where several researchers have addressed the issue (for example, Mannermaa, 1999a, 1999b, 2004, Hiltunen, 2000a, 2000b, 2000c, 2001, 2005a, 2005b, Moijanen, 2003 & Kuosa, 2005). In addition, the concept has been tried to be clarified using the Delphi method (Kuusi et al., 2000); a study

criticized by Moijanen (2003) who has particularly argued that this has contributed to the fuzziness of definition.

5.2.2 Outcomes of the article

This article introduces a new concept - the future sign - to overcome the problems of defining weak signals found in the previous literature. The future sign utilizes semiotics, particularly Peirce's (1868) triadic model of a sign (see Figure 23), in which Peirce divided a sign into three aspects, the representamen, the interpretant and the object.

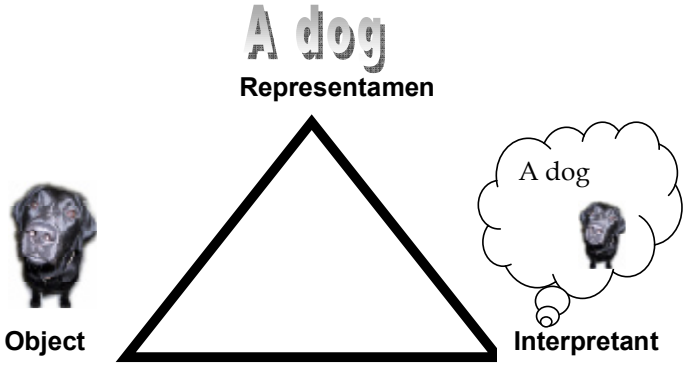

Figure 23. The "Peircean" sign.

In the example in Figure 23 the object is the real dog (flesh and blood of the animal), the representamen is the word used for the creature (in this case the word dog), and the intrepretant is our interpretation of the word dog. With regard to Peirce's sign the object is objective, and the interpretant is purely subjective, and dependent on the receiver of the sign. The representamen is between objective and subjective; for example it depends on language. For the English the black creature in the figure is a *dog*, for Finns it is *koira*.

In the same way, the future sign consists of three dimensions: the signal (which could for example be a news article, rumor, or a photo) that corresponds to Peirce's representamen, the (emerging) issue that corresponds to the Peirce's object, and the interpretation or sense made of the signs future possibilities that corresponds to the Peirce's interpretant. To examine the dynamic characters of the future sign, a three dimensional model is presented in Figure 24.

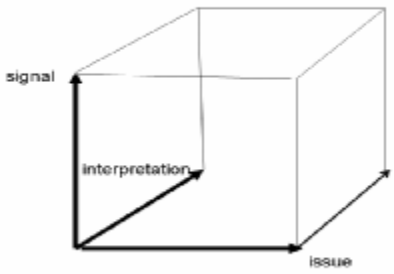

Figure 24. The three dimensional future sign.

A single future sign can exists at whatever place in the cube. The strength of the individual sign is measured by counting its distance from it place of origin. The closer it is to the place of origin, the weaker is the sign. As one dimensions of the future sign increases, the strength of the sign increases. Units of the dimensions include for example, with regard to signals, the number or visibility of the signals; with regard to issues the number of events; and regarding the interpretation, the receivers understanding of the meaning of the future sign.

Two different examples of future signs are presented in the article. These are: a weak future sign (The selling of vintage clothes by Hennes and Mauritz [H&M]) and a strong future sign (the internationalization of Nokia). Figure 25 presents the different locations of these signs in the three dimensional future sign model (cases H&M and Nokia).

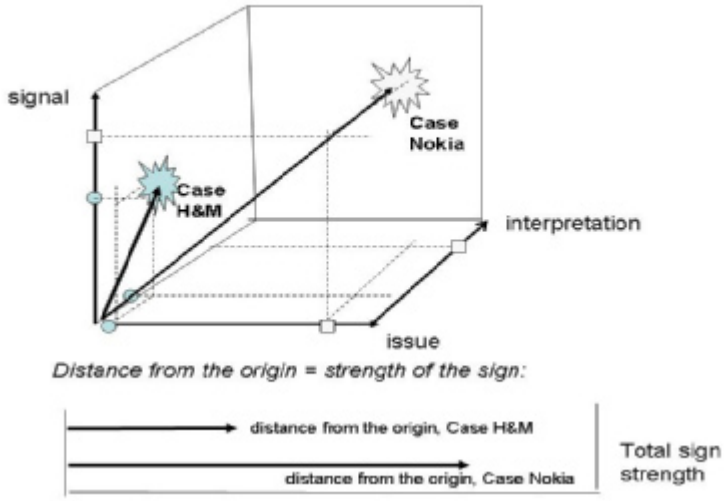

Figure 25. Weak future sign and strong future sign (case Nokia and H&M).

Although the future sign can provide suggested strengths for the signs (weak or strong), it is not intended to give specific, numerical values of the sign's strength. The principal purpose is to unwrap the previous discussion about weak signals, and provide insight to the various aspects of the weak signal discussion.

The model of the future sign answers the critique of the definition of certain characteristics of weak signals; for example its relation to transition phenomena, the duration of a weak signal, the objectivity and subjectivity of a weak signal, and the intensity and strengthening of weak signals; all of which were discussed by Moijanen (2003). By changing the discussion away from signals the future sign a more holistic view of change is presented. The article also introduces two different categories of weak future signs: early information and first symptoms.

Although the future sign is intended to be a theoretical framework for understanding weak signals, it also has practical value for understanding change. In particular, it clarifies the difference between what is really happening (the issue) and what its information value (the signal) is. The future sign gives an opportunity to estimate future changes more objectively by combining the three dimensions. Although the concept answers Moijanen's (2003) critique fairly well it is not a finalized or inclusive model that can solve all the problems connected to weak signals and change. On the contrary, it is a first step to thinking of the theoretical aspects of weak signals and therefore there is some ambiguity concerning the future sign. However, it should provide an inspiration and platform for researchers to search for a better theoretical explanation of weak signals. It also provides insight to the following article which concerns the signification process of the future sign.

5.3 Article 3: The Signification Process of the Future Sign (by Kuusi and Hiltunen)

This article, which was co-authored with Dr. Osmo Kuusi, is a further development of the concept future sign. Where the previous article focused more on explaining the relationships of signals, issues and interpretation, this article focuses more on the dynamic process of signification and the change. The starting point of the article was to solve some of the ambiguities of the future sign and to more examine the change process and the actor's role in change.

5.3.1 Background of the article

The future sign's dynamic feature is the key focus of this article. For this purpose Tarasti's (2000) theory of exosigns and endosigns is utilized to provide a clearer understanding of emerging issues. Exosigns refer to signals in the outside world while endosigns refer to signals inside our minds. These signs have different emphasis and affects on emerging change and understanding of such change[6]. The outcome of this article, a detailed description of signification process, provides understanding to managers of the possibilities to seize forthcoming important issues in a timely way.

5.3.2 Outcomes of the article

The main outcome of this paper is a detailed description of the signification process of the future sign. In this article the signification process means "the emergence and development of issues and exosignals connected to them, interpreting them (transferring them to endosignals), recreating (secondary) exosignals for communication, and acting based the signals and other issues. The process of signification is shown in Figure 26.

[6] While Tarasti discussed about exosigns and endosign in this summary part of this thesis exosignals and endosignals are used as synonyms for them for avoiding confusion with the term the future sign.

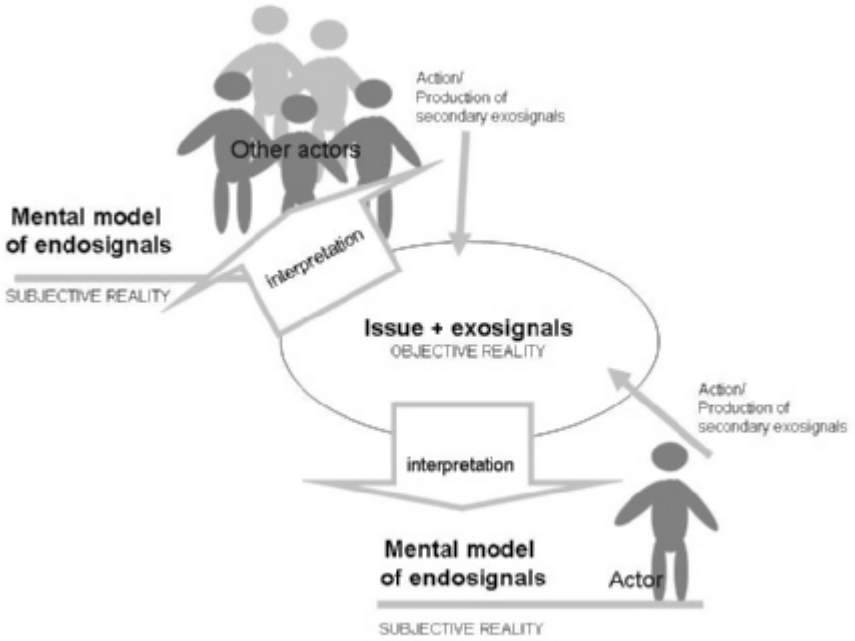

Figure 26. Signification process and its interaction and interconnections.

The signification process starts with the emergence of an issue, which is represented by signals; in other words (primary) exosignals. It is also important to note that the issue itself usually develops temporally and creates further primary exosignals. Exosignals are received by an actor who then interprets them. The actor can notice early exosignals or just late ones. In the interpretation phase exosignals turn into endosignals of the actor's mental model. Depending on the interpretation, an actor makes his/her decision to act on the issue, i.e. directly to affect on it. The actor can also send new exosignals (called secondary exosignals) to other actors and thereby try to make them act on the issue. The action is related to the positive or negative value given to the secondary exosignals by its sender. The interpretation of the receiver depends on his or her skills to decode the message. The receiver may act on the issue and/or send new exosignals and so forth. The signification process of the future sign is clarified in a practical example that of an asteroid approaching globe:

ASTEROID APPROACHING THE EARTH

In the early development phase of the issue, an astronomer perceives a small spot of light. This is the first perceived primary exosignals of the issue. The first perception of the issue might happen later e.g. when the astronomer informs the Harvard Minor Planet Center. In the Center, researchers make an interpretation that there is a PHA (Potentially Hazardous Asteroid). As the asteroid comes nearer, there are more informative primary exosignals. If neither primary exosignals of the asteroid are perceived nor interpreters see any risk related to the asteroid, the perceived relevance of the issue is near zero. The ignorance might, however, be a crucial matte if the asteroid is on target to hit the earth.

Apart from the primary exosignals of the issue, involved actors produce secondary exosignals. The observer and researchers of the Harvard Minor Planet Center write articles in newspapers, thereby transforming their endosignals to secondary exosignals that are visible to many. Those who have read the articles might write further articles. Thus the number of secondary exosignals that are based on endosignals (interpretations of people) might also increase step by step.

The exosignals and endosignals of the issue might result in action that has an impact on its perceived (and objective) relevance. Some action, e.g., a hydrogen-bomb explosion on the asteroid, might resolve the issue and make it irrelevant.

When considering emerging issues and acting on them, the potential to act depends on the nature of the issue and the actor(s) involved. The issue can be strongly dominating (no-one can affect on it), dominating (a cluster of actors can effect it) or masterable (individual actors can also affect the issue). The actor can, for example be one person, a community or human kind. For some actors, such as individuals, the same issue can be dominating while for others (a community, humankind) the issue can be masterable. An example of this is

capital punishment, which for one person is dominating but for a community it is masterable. This means that one person (if a dictatorship is excluded) cannot make a difference, but a community can, by for example enacting a law forbidding capital punishment. The urgency of the issue can change the nature of the issue as time passes. For example an issue that was previously masterable can become dominant or even strongly dominant with the passing of time. Table 6 enlightens the change of characteristics of issues according to changed actors.

Table 6. Actors, issues and their variables. Note: same issue might have different actor impacts according to who is the actor.

	The nature of the issue		Actor impact			Actor			Stakeholder			Urgency		
Issue	natural	social	masterable	dominating	strongly dominating	person	community	humankind	person	community	humankind	no	medium	urgent
the rise of the water level in a river	x		x				x		x	x			x	x
climate change brought about by the greenhouse effect	x			x		x	x		x	x	x		x	
climate change brought about by the greenhouse effect	x		x					x	x	x	x		x	
capital punishment		x	x				x		x	x			x	
capital punishment		x		x		x			x					x

The interpretation process of the future sign includes turning exosignals into endosignals in the mind of the receiver. A possible next step is to produce further exosignals (called secondary exosignals). This process is called the dissemination of exosignals. An actor can also ignore the signals (i.e. do nothing with them) or act directly on the issue. To understand the real connection of the exosignal and issue, theory formulation is necessary. Theory formulation also helps the actor to understand issues that are not visible to us based

on their exosignals. Theory formulation is particularly valid for issues in the category of natural issues.

5.3.3 Managerial implications of the conceptual articles (articles 1-3) for organizations

Although wild cards have been used as a synonym for weak signals, they do not have the same meaning as weak signals. Rather, wild cards are rapid changes with huge impact while weak signals are signs of emerging issues. However, there is a connection between wild cards and weak signals; weak signals can be utilized to anticipate wild card changes. From an organization's point of view this means that when a weak signal is spotted, the urgency of the emerging issues (wild card) needs to be estimated. However, because of the rapidity of a wild card type of change this is often impossible (see Mendonça et al., 2004).

Although discussion and interest concerning weak signals has increased in the organizational environment, companies need to be aware that they do not only focus on the weak signals as indicators for change. Certainly, weak signals are valuable, but the holistic picture of the change (the future sign, and the signification process) should also be carefully examined. This is particularly important, because in some cases the quantity of signals does not match the true state of the issue. Digging into the true state of the emerging issue is important to better understand forthcoming change. In addition trying to find the early sources of weak signals (primary exosignals) will reveal good information about the potential forthcoming change.

Organizations are in a position of an actor in the signification process. They have the potential to interpret exosignals of emerging issues, and thereby influence the issue. Alternatively they might be stakeholders, and consequently the issue might affect their business. When an issue is emerging, careful examination is required because the potential to affect the issue might change over the passage of time. A masterable issue might become

a dominating issue if it is ignored. In that case an "opportunity window"- the potential to affect the issue - is closed and the result can mean a demand for more energy to address the problem.

It is possible to anticipate emerging of issues by looking at their exosignals. Acting on the issue can take place in two ways: directly, trying to individually affect the issue, or by sending more exosignals in order to try to make other actors join forces to act on it. For an organization, developing response strategies to the coming issue via the examination of its exosignals is important.

There are special cases that are important to consider. Sometimes the quantity of exosignals can be exaggerated in comparison to the issue itself; a situation known as hype. The converse situation, censorship, occurs when exosignals are suppressed compared to the emerging issue. Thus in order to anticipate change and the examination of the 'true' situation of the emerging issues, organizations need to have the requisite eagerness to explore the sources of the first (primary) exosignal.

5.4 Article 4: Good Sources of Weak Signals: A Global Study of Where Futurists Look for Weak Signals

This study focuses on the visible dimension of the future sign and signification process – in other words exosignals. It considers the environmental scanning procedure, particularly the sources that are used for scanning changes in the environment - i.e. sources of weak signals. The purpose of this study was to benchmark the sources for weak signals from those individuals who are working globally with futures issues. In other words this study aimed to find "best practices" for finding weak signals. The results of this study (the various sources that are preferred by futurists) could be helpful for organizations to redesign their scanning process and to better organize the potential for organizational futures learning.

5.4.1 Background of the study

The research questions of this study aimed to answer the following issues: what are general good sources for weak signals; what are good sources for weak signals in different areas of life; and what categories of sources are preferred in finding weak signals. In addition, the study aimed to reveal the general opinions of futurists about finding weak signals.

When attempting to develop "best practices" for finding weak signals, the most challenging task was to get access to the people that are experts in futures and thus in finding weak signals. Kuusi (1999:35-36) defined three types of experts about futures: scientists, decision-makers, and synthesizers. This study aimed to reach the future expert group *synthesizers*; those that are able to understand the interplay of factors that shape the future (Kuusi, 1999:36). An example of synthesizers is futurists, whose work includes anticipating future changes. But the major questions are who are the futurists, and how to access to them? In this study futurists (or as the study refers to them as future-oriented people) were defined as people working with futures issues. The expertise of the respondents were ensured by using channels (such as World Futures Studies Federation mailing list, the Millenium project mailing list, and the Future Takes publication) that are used by futurists, and by specifically asking about the respondent's expertise (numbers of years) in the questionnaire. The sole respondent that marked to have no expertise was withdrawn from the analysis. In this study the expertise of the respondents was calculated only by years.

Because the concept futurist is quite blurry, it is difficult to define the overall population of futurists and composition of that population. In practice this means that the random sampling of the futurist population was impossible, which makes the generalization of the results of quantitative analysis impossible and only speculative. In this study quantitative analysis was carried in order to find the respondents' most preferred sources for weak signals.

This research aimed to reveal what sources futurists consider as being good for the discovery of weak signals. In the study an Internet based questionnaire, provided by Webropol, was used. The questionnaire was first tested on individuals from the Finland Futures Research Center (FFRC) as a pilot study, and minor modifications to the questionnaire were made based on the analysis and comments of this pilot. For the global study 121 people responded of whom 3 were excluded.

The questionnaire consisted of three sections. The first focused on discovering the background information and particularly experience in futures field. In the next section the respondents were asked about the primary area of life (political, economic, social and cultural, technological and science, environmental and educational and learning) in which they follow change most frequently, and also the second area of life. For those areas of life they were also asked to mark the sources they consider good for finding weak signals. The respondents were also asked the best and second best sources for weak signals in these areas and reasons for evaluating them so highly. The third section of the questionnaire gave the respondents freedom to write comments about good sources of weak signals and to comment on the questionnaire itself.

5.4.2 Outcomes of the article

The results of the international study showed there are differences in the sources that are considered good according to different areas of life. Some sources were placed in the top ten sources for certain areas of life, but for other areas the same sources could be far less important. For example, politicians were appreciated as top sources on the subject of political changes, and patents were top sources with regard to technological changes, but in other areas of life these sources were not so well appreciated. However some sources were considered good for many areas of life. Among these were scientists, futurists and colleagues, the academic and scientific journals and reports of research institutes. It

appeared also that all source categories (human, textual and online) were appreciated almost equally by respondents of this international study. However, human sources were the slightly more appreciated of these categories. In this study categorization followed the method employed by Choo (2000).

The results of this study provide valuable information to organizations to enable them to plan or modify their environmental scanning procedures and to better organize facilities for organizational futures learning. The results of this study show that in order to obtain a good overview of where the world is going there are sources that could be added to the scanning list. Futurists are the people who are tasked to look for changes in the world. As one of the respondents commented, scanning the scanners is a good way to find weak signals. The individuals who are 'creating' the future, such as scientists, artists, leading users and the fringe, are good sources to track, as are the sources that document their actions such as popular science journals and the marginal press.

5.4.3 Managerial implications

Anticipating changes in the business environment is challenging for companies. It is not only changes in their own industry that are important to recognize, but also changes in other areas. While most companies will have expertise in areas of developments and trends in their own industry, scanning for changes in the other areas of life can be neglected. Yet, today issues are highly interconnected and they can affect each other, and therefore looking at new sources that are not solely focused on the inside of organizations, can contribute to and facilitate the organizational learning process. This also widens the environmental filter of the company.

Kuusi (1999) divided different kind of expertise in the field of futures in three categories: scientists, synthesizers and decision-makers. This study focused on synthesizers (futurists) that seem to have tendency to scan the outcomes of scientists. Synthesizers also scan other synthesizers, which at the best has a cumulating affect on weak signals. However there is

also a danger that this loop can strengthen so called “collective blindness”. The work of futurists’ (the synthesizers) often includes helping company or public sector decision-makers to think futures. The link between the different kinds of future’s expertise is shown in Figure 27.

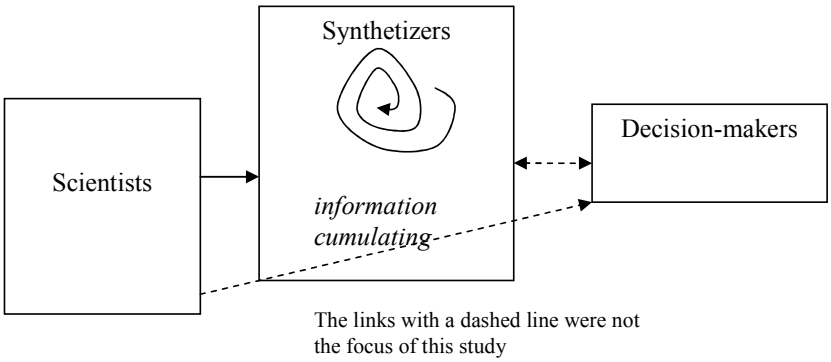

Figure 27. The flow of future expertise from scientists to decision-makers.

As can be seen from Figure 27 the synthesizers are located in the central part and contribute to the holistic picture of future possibilities. They combine information from the scientist community and consider its meaning with regard to the future. They also follow other synthesizers in order to seek their views about future development. From an organizational point of view co-operating with synthesizers provides valuable insights about futures. In addition it is important to have independent ways to scan the environment.

5.5 Article 5: The Futures Window – A Medium for Presenting Visual Weak Signals to Trigger Employees' Futures Thinking in Organizations.

There are some methods for analyzing weak signals in organizations (see for example Ansoff, 1984 & Coffman, 1997e). These methods combine creating future scenarios or assessments of the urgencies of issues and then acting on them. The methods are, however, quite complex and principally aimed at people working on strategic issues in the organization. The aim of the study reported in this article was to test how weak signals could both be disseminated widely and used inside organizations in order to break their mental models and presumptions (and at the same time enhance organizational futures learning capabilities). The tool presented in this paper - *the Futures Window* - aims to offer a solution to the challenge of spreading weak signals in an organization in visual forms and to trigger futures thinking of employees. In addition the Futures Window offers the potential to look at futures in a "not so serious" and formal way and therefore more likely to lead to employees becoming inspired by futures' possibilities. At the best, the Futures Window can make it possible for organizations to play with new ideas of futures'.

5.5.1 Background of the article

The concept of the Futures Window is to provide monitors that present weak signals in the premises of organization in a visual form. Examples of visual weak signals are images, photographs, animations or video clips of new inventions or strange things that are happening today. The Futures Window monitors are installed in canteens, coffee rooms, elevators, lobbies, toilets, or wherever a company's employees are likely to stand still for a short while (see Figure 28).

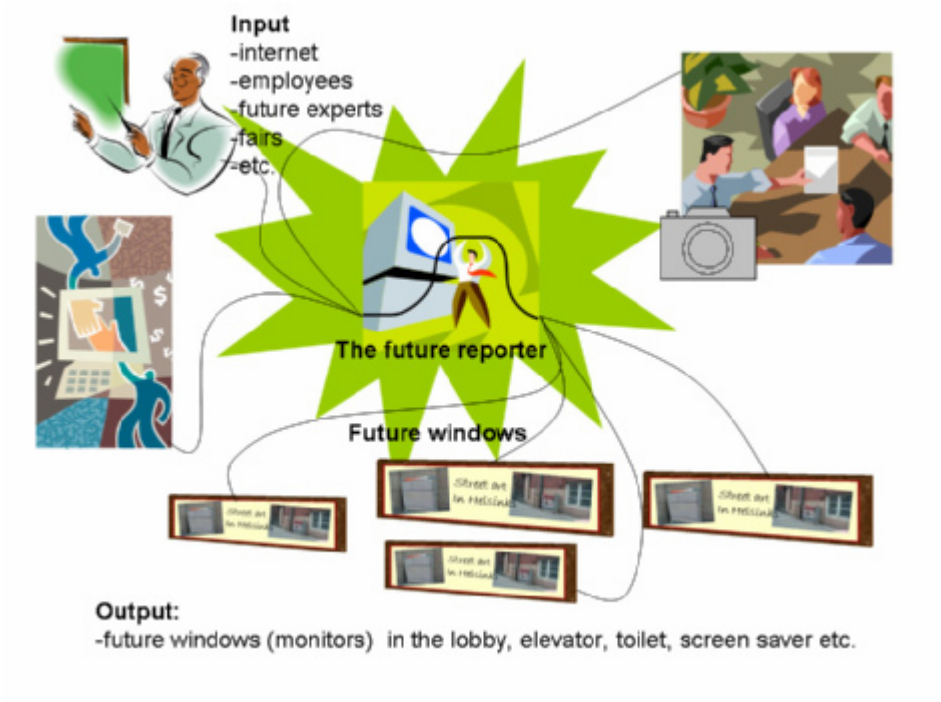

Figure 28. The chart of the Futures Window.

In organizations and in the field of strategic foresight, methods that are based on images are scarce. In this field the written form of articulation is preferred even though, for example, advertisers have long realized the power of images (Davis, 1992). However, there are some compelling reasons to prefer the use of images. They are for example faster and easier to process than text (Näsänen, 2006 & Biederman, 1990).

The Futures Window utilizes visual weak signals that are in the form of so called novelty images. These are projected into walls or shown on the monitors to achieve an easy way of disseminating weak signals. The aim with the Future Window is to trigger employee's futures thinking. Raising attention is the first step for the employees to perceive the images. In the Futures Window some "ploys" are used to get employees' attention. Firstly, the images are for the most part novel to people. Novelty is important for activating passive

attention (the orientation reflex) (see for example Paavilainen et al., 2006). In addition by only showing images for a short time there are lower expectations, assumptions and views of the receiver that affect perception. (Gibson 1966, cited in Mustonen, 2001). The Futures Window also utilizes a big screen size, which has been found to increase attention (Reeves et al., 1999). To avoid attention blindness, the Futures Window monitors were located in places where the influence of other stimuli was limited.

The Futures Window was piloted in an adapted version at VTT Technical Research Centre of Finland in two pilot studies in November-December 2006, and January-February 2007. This was carried out in co-operation with VTT's Technology Futures Forum. The first study (Pilot 1 in the paper) took place in two seminars arranged at VTT on November 17th (referred to as the first seminar) and December 1st 2006 (referred to as the second seminar) and it was combined with a group exercises based on the material in the Futures Window. Based on of the images, the participants started to think of services/products that might have a demand in the future. For this process, the participants were given a form, which included the basic steps of the exercise.

The second study (referred as Pilot 2 in the paper) was arranged in the VTT building DigiHouse during week 9, in 2007. In this pilot a show of visual weak signals was projected on to a "glass box" type of wall for one week. This pilot followed the initial idea of the Futures Window more closely. In both pilots the visual weak signals slide show consisted of 48 images. All the images were individually shown for 10 seconds at the time, resulting in a show of about 8 minutes. The participants of the first pilot were asked to complete a questionnaire in which their opinions about the new method were asked during the seminar. In order to obtain opinions in the second pilot, the questionnaire was sent to people working at the DigiHouse. The questionnaire included statements about the Futures Window: for example - "*Futures Window gave me new ideas about the future"* and *"The Futures Window could be useful activator of futures thinking in my own work".* The respondents were asked to mark they opinion in a 5 point scale - fully disagree, somehow

disagree, somehow agree, fully agree and cannot say. The respondents were also permitted to write comments about the new method.

In Pilot 1, 30 people from the total of 74 participants answered to the questionnaire giving a response rate of 40,5%, which can be considered good. In the second pilot 280 people were contacted by email and 39 responses were received, leaving the response rate to only 13,9 %.

5.5.2 Outcomes of the article

The feedback received from the survey concerning opinions of the Futures Window was generally very positive in both of the pilots. This is revealed in the statistics of the answers and the respondents' written comments. The majority of the respondents thought that the Futures Window triggered futures thinking. In addition the majority the respondents also agreed with the idea that there could be Futures Windows in cafeterias or canteens at VTT. The majority of the respondents also considered it important that employees were able to participate in creating the contents of the Window by sending images to the Futures Window.

The images, which most triggered people's attention, were those that had a shocking or radical theme. This supports the finding of previous studies (e.g. Wanta & Roark, 1993 & Zillmann, 2001). In particular, images with manipulations of people were of interest. In addition, images that could be considered as cute (Nabaztag, a cat) were remembered better than other images. In summary, the images that invoked emotive feelings (positive or negative) were the ones that received attention.

Pilot 2 revealed that the environment in which the Futures Window is displayed is essential. For example settings such as a lobby were not thought to be relevant.

The findings indicate that the Futures Window has the potential to be a good tool that will trigger futures thinking and organizational future learning. Furthermore, it could be a useful tool for enhancing futures-oriented thinking in seminars or ‘brainstorming’ type work. In all its uses it is crucial that employees are included in this kind of futures work.

6 Reflections from the study

The aim of this chapter is to summarize the findings of this study and to provide answers to the research questions. The research questions of this study were defined in chapter 1.2. The first research question was:

1) How are weak signals defined in the existing literature and how could this concept be clarified further?

This research question also included sub-questions. The second research question focused on examining the role of weak signals in organizational futures learning.

2) How could organizations scan and use weak signals?

6.1 How are weak signals defined in existing literature and how could this concept be clarified further?

As discussed earlier in this thesis there are various definitions and views of weak signals in the academic literature. It was therefore seen as important to first clarify the concept of weak signals before considering their implications to organizations. Thus, the first research question was defined as "How are weak signals defined in existing literature and how could this concept be clarified further?" In order to answer that principal question some sub-questions were considered to be important. These questions answered in the following paragraphs, are:

a) What are weak signals and how does the concept differ from related concepts (i.e. wild cards)?
b) How does strategic change happen and how are weak signals related to this?

One key problematic issue discovered in the literature of weak signal definition is the use of weak signals as a synonym for wild cards. For example Mannermaa (1999a) has used these two terms as synonyms. Therefore this study took a closer look at the term wild cards and its definitions in the existing literature and aimed to clarify the confusion between the terms wild cards and weak signals. This study also emphasized the link between weak signals and wild cards.

A careful examination of the literature provides support for the view that although the terms weak signals and wild cards are used both interchangeably and as synonyms they represent different phenomena. Wild cards are events with a huge impact whereas weak signals are signs of small events or emerging issues, whose impact on the future may differ from being mild to huge. A similarity between weak signals and wild cards is that they represent issues that are real, existing today or in the past. They are not visions about what might be in the future. The notion of visions of the future can be more properly labeled as wild card scenarios rather than wild cards. Because wild cards have a big impact on the future, it is important to try to anticipate them. Although anticipating wild cards is a challenge, weak signals are one tool that can be employed to address that challenge. With wild cards there are signals that indicate they may happen. However, these signals are sometimes difficult to notice. Table 7 clarifies the differences between weak signals and wild cards (answer to sub-question (SQ) 1a).

Table 7. Differences of wild cards and weak signals (research question 1 a)

	Weak signal	Wild card
Description	a signal of an emerging issue	rapid event that has huge impacts
Visibility	small	huge
Impact	not impact as such, but underlying issue's impact can be anything between zero to huge in the future	huge
Relationship to each others	weak signals are preceding wild card events	

The sub-question 1a also included the examination of the characteristics of weak signals. This study focused on understanding the weak signals, not only the definition of them, but also their relationship to the change process. The future sign concept that was one outcome of this study, emphasizes the various dimensions of change and weak signals in it. Before, weak signals have been defined in the literature as varying from emerging events to future related information. The future sign combines both of these aspects and also includes the aspect of the receiver's interpretation. The future sign also differentiates the two dimensions of the change process: what is objectively happening (objective reality) and how do people interpret that (subjective reality). See Figure 29. (answer to SQ 1a)

The signification process further clarified the nature of weak signals by dividing them into primary exosignals and secondary exosignals. Primary exosignals are the first signals of the issue with no external interpretation to them. An example of this kind of signal is a person's visual observations of new issues, like seeing the first drop of water falling from the sky before heavy rain. Secondary exosignals, on the contrary, are signals that are interpreted by someone and resent to other actors. An example of this kind of signal is that of a person, who has interpreted the primary exosignal, makes a phone call to her relative to tell them about the heavy showers (answer to SQ 1a).

When examining the objective dimension (signal/ issue dimension) of the future sign it is possible to notice that there are various possibilities for signal / issue relationship. In typical cases, when the number of issues increases, the strength of the signal (measured for example by the visibility of signals) increases. In Figure 29 this is the case in line A. However, there are also possibilities for distorted relationships of signals/ issues. In the same figure, there are two different possibilities described: Line B and Line C. In the case of line B, the strength of signals is strong, even though the number of issues is relatively low. This case is called hype and happens when the primary signals are exaggerated by various actors. In practice this means that excessive amounts of secondary exosignals are exaggerating the real state of the issue. An example of hype is "dotcom bubble", where the possibilities of internet companies were exaggerated in the media and public discussion in the late 1990's. Line C describes the opposite case, where signals are suppressed even though the issue is existing. This is called censorship. Censorship happens, for example, when secondary signals are used to neutralize the primary exosignals. Example of censorship occurs in dictatorship, where the voices of the opposition are usually suppressed. (SQ 1a)

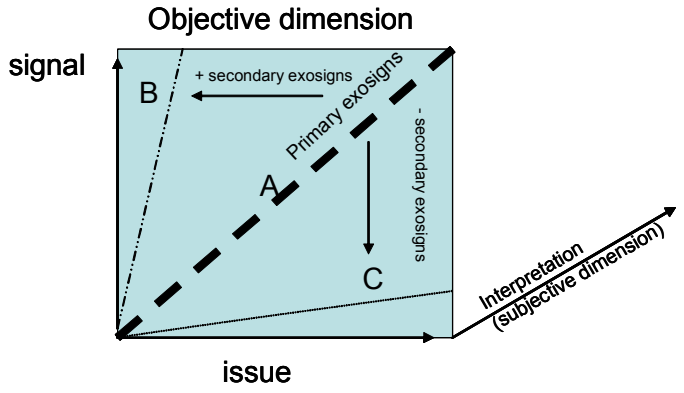

Figure 29. Future sign with special focus on objective dimension (dimension signal-issue). Lines A, B, C describe various possibilities of signal/issue relationships.

Figure 29 explains the importance of differentiating the emerging issues from their signals. Even though signals and issues are an interlaced pair, meaning that they appear combined and are sometimes difficult to separate (specially in the case of primary exosignals), it is important to highlight difference between these two concepts. From the point of view of the change process the issue and the development of it is the most crucial, whatever the signals are telling us of it. Seeing beyond the signals (=the real state of the issue) is important when trying to anticipate the emergence of a new issue.

Only in the late stage of the writing process I have familiarized myself with a new idea of vertical tools for futures studies, which are inspired by poststructural thinking. Vertical tools, like Causal Layered Analysis, include more deep thinking of the underlying metaphors of for example emerging issues. The future sign and the signification process include the subjective dimension, which fits to the horizontal futures thinking. The subjective dimension, interpretation, allows for diving deeper into the metaphors and cultural assumptions of the perceived signals. This dimension could encourage for critical futures thinking, questioning the assumptions that are related to the world that we see around us and the changes that are spurring.

This study clarifies the role of weak signals in the change process and underlines that weak signals are signals of emerging issues. Emerging issues are single events, or clusters of a small number of events. One example of this is a social campaign “Hugging Monday”, which aims to bring joy to workplaces on Mondays by wishing people a nice work day with hugs and sharing small notes of aphorisms. The campaign was set up by me and my friend Minna Takala who did the hugging and sharing of the positive notes with employees at Nokia in May, 2009. What makes this campaign a possible emerging issue, is that it has been arranged only once. In the future, this workday hugging campaign can spread all around the world and become a smaller trend, or vanish, because of lack of enthusiasm of the organizers.

Weak signals of the emerging issues can be for example small articles in papers, visual observations, rumors, discussions, photos etc. What makes these signals weak is the low visibility or small number of them. A primary exosignal type of weak signal of the Hugging Monday was visual observations of the two huggers, and the secondary exosignal type of weak signals was a single small article of the campaign in Finnish magazine Talouselämä (17/2009, 30th April 2009, page 53) (see Figure 30). The challenges of the secondary exosignal are revealed in the small article, where the journalist had understood the idea of Hugging Monday slightly differently, thinking it was happening nationwide, when it happened only on one occasion at Nokia.

Halaa pomoasi

Näinä kireinä aikoina työhyvinvointi on koetuksella. Auttaisiko työkaverin halaus?

Toukokuun ensimmäisenä maanantaina 4.5. tämän voi testata. Silloin on virallinen halauspäivä.

Asialla ovat Nokiassa työskentelevät **Elina Hiltunen** sekä **Minna Takala**. He haluavat parantaa työhyvinvointia *Hugging Monday* -tempauksellaan. Kaksikon työnantaja ei ole hankkeessa mukana.

Figure 30. A small article of Hugging Monday in Talouselämä magazine.

Strong signals of the campaign would be stories, with large visibility in various newspapers, or other media. The differences of signals, as weak or strong, are described in Figure 31.

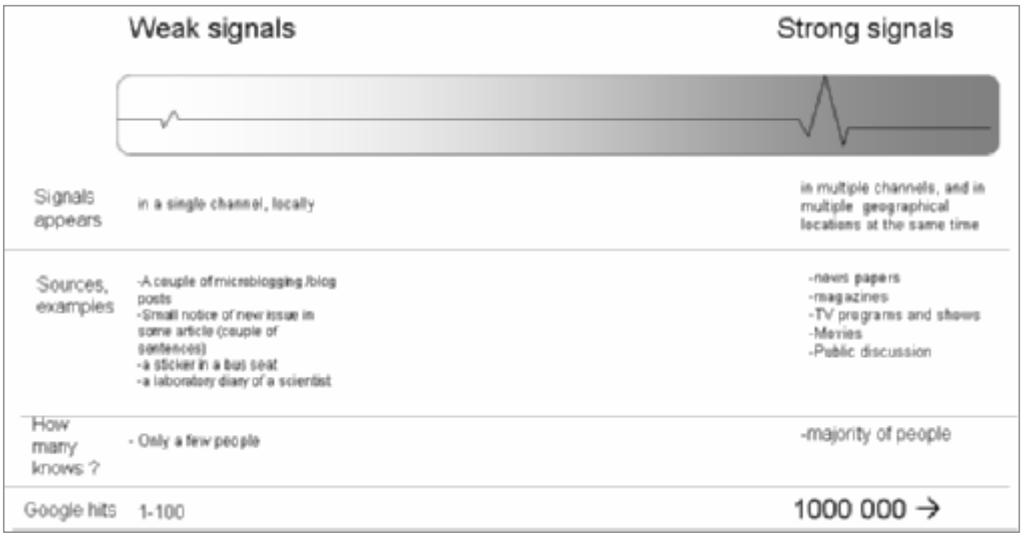

Figure 31. Differences between weak and strong signals.

Figure 31 describes the basic differences between weak and strong signals. When the signal is weak, it appears in a single channel and locally. Strong signals on the other hand are found in multiple channels in multiple geographical locations at the same time. This admittedly leads to the fact that many people are exposed to the signals and thus know about the issue that the signals indicate. Sources for strong signals are, for example mass media, while weak signals can be found in sources that are limited/ followed by a few people. Examples of these kinds of sources are laboratory diaries of researchers, a sticker of some grass root activists' campaign in a bus stop, small stories in papers, and sometimes blogs and microblogs. It is difficult to put a concrete scale on the strength of signals, but one concrete example could be number of results in a Google search. If the search results in

1-100 hits, the signal can be called weak, if the results are over 1 million hits, the signal is definitely strong (Answer to SQ 1a). An example of Google search for two issues: globalization and Hugging Monday are presented in Figure 32 and Figure 33.

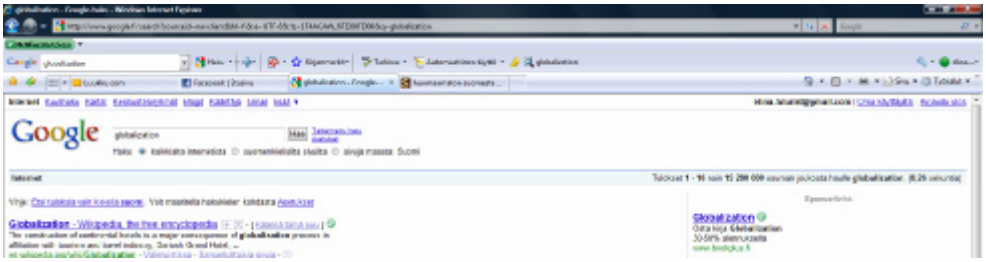

Figure 32. Google search for globalization. Results: 19 200 000 hits (June, 2009).

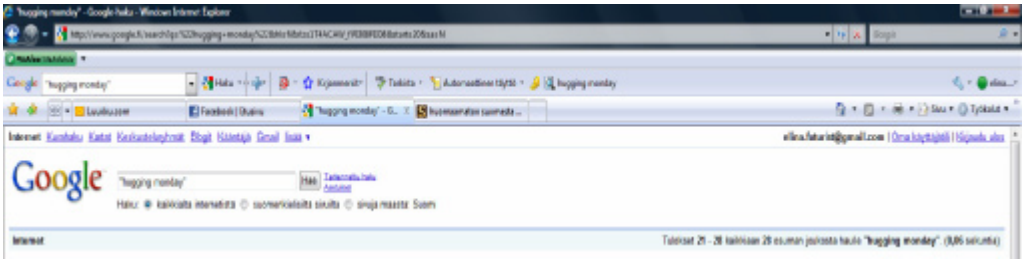

Figure 33. Google search for "Hugging Monday" results 28 hits (June, 2009).

Figure 32 and Figure 33 give examples of using a Google hits scale to measure the strength of a signal. In the case of globalization, the result is over 19 millions pages, while with the case of "Hugging Monday" the result is only 28 pages. The outcome of this search is that signals for Hugging Monday are still weak, while signals for globalization are strong. It is to be clarified here that that Google search scale for measuring signal strength is only directional.

One target of this research was also to clarify the change process and connection of weak signals in it. The concept future sign was refined to the signification process that examined more closely this dilemma. The signification process describes the change beginning from emergence of the issues and its coming on to the agenda (meaning that the issue has potential relevance to some actor). When the issue is emerging it emits signals, which are called primary exosignals. These signals are possibly received by some actors who then decide what to do with them by processing this information (turning exosignals to endosignals) in his/her mind. The actor has some choices with the signals.

An actor can observe exosignals, send exosignals, be influenced by the emerging issue and act or react to that issue. An actor's potential to affect the issue depends on its nature and the actor's influence. A masterable issue can be affected by a single actor, whereas dominating issues require the action of multiple actors. Strongly dominating issues can only be reacted upon. (Answer to SQ 1b)

The signification process of the future sign emphasizes the fact that weak signals do not exist in a vacuum, meaning that they are involved in the change process in many phases, and their meaning can be also distorted in the process by various actors (research question 1 b). Media is an important actor connected to the change process.
A good example from the literature about this is found from Ainamo et al. (2006), who discussed the business journalism in Finland during the Cold War. They emphasized the power of the media in a change process. They concluded that at that time business journalists were both shaped by the ideological struggles and agents, promoting specific kind of ideas. Today, innovation journalism has a key role in the change process, as it familiarizes people with new innovations. Ainamo (2006:14) underlined the role of innovation journalism: "Innovation journalism can have multiple roles. It need not only be a mediator between science, technology, and business, but can also be an active agent of change."

By answering the sub-questions the research question 1 has been answered too. Therefore an overall definition of weak signals, based on the theoretical examination of this study, is given here:

> Weak signals are indicators of possible changes. They are not synonyms to emerging issues. While emerging issues refer to an event or clusters of events, weak signals are signals of these events. In practice these signals can be for example articles in scientific journals, or notes in a diary of a researcher, blog or microblog posts, rumors and visual observations. The strength of the signal can be measured by its visibility or amount of them. Weak signals have low visibility, and they appear in very few channels. Strong signals, on the other hand, appear in multiple channels, usually in the mass media, with wide visibility, and they are known to most people. While the absolute strength of a signal is difficult to measure, the amount of hits in Google searches might give a direction to the strength of a signal.
>
> For clarification, weak signals can be divided into primary exosignals and secondary exosignals. The first ones refer to signals that are in direct connection to an emerging issue. In practice, this could mean visual observations of the issue. Secondary exosignals are signals that have been interpreted and resent by someone. These kinds of signals always include a risk of being distorted. When talking about signals it is also important to talk about the receivers of them, i.e. actors, which are a necessity for acting on a change. Actors are in key role when it comes to receiving, interpreting and disseminating signals and acting on an emerging issue.

6.1.1 Implications of the weak signal definition for organizations

Even though the first research question of this study focused solely on the definition part of weak signals, the results have some implications to organizations too. Firstly, organizations should not only focus on weak signals when thinking of forthcoming changes; weak signals are only signs that can be in the worst case incorrect. When seeking the truth of the emerging issues finding the authentic or reliable sources is important. Today this can be challenging as for example the Internet is full of information that is questionable[7].

Secondly, from the point of view of organizations there is also a risk of "collective blindness" when it comes to futures thinking. In practice this means that primary or secondary weak signals are further interpreted to secondary signals that are not in line with the true state of the underlying issue. The reason for this might be that, in believing some kind of futures, only signals that are strengthening that vision are allowed inside the organization. This again could be avoided by trying to find the authentic signals (primary exosignals), and questioning the mental model of the organizational futures views.

Thirdly, by understanding the logic of change (the significations process of the future sign), organizations can better evaluate their possibilities to act on some issues and affect the direction of the change. Reacting on the issue at a right time is essential, because the opportunity window may close if nothing is done. Emerging issues, when spotted, should be evaluated on their impact and organizations' willingness to act on them as soon as possible. This gives organizations more time to react or if necessary, form coalitions on acting on some issues or start creating reaction plans. Thus, scanning signals, and finding

[7] The word *questionable* here refers to the fact that the information has not been assessed by experts. However, it can be claimed that all information is questionable in some sense, because, for example, cultural and educational backgrounds have an effect on the perception of information and "truth". Even experts in the same area can have different ideas about the truth. In the case of the Internet, however, the anonymity of the information provider can conceal the real motivations and the educational level of the provider.

emerging issues by scanning, is necessary and important for organizations, and this process should be included as a part of the strategy making process.

6.2 How could organizations scan and use weak signals?

The second research question that this study aimed to address concerned how to connect the practical implications of weak signals to the organizational futures learning perspective. The research question was:

How could organizations scan and use weak signals?

This thesis has introduced a new concept, organizational futures learning (OFL). A short definition of this concept is: organizations' processes to anticipate and innovate futures, where weak signals play an essential role. This thesis assessed the OFL using two studies that focused on various perspectives of OFL: sources that are used to scan weak signals and disseminating weak signals in an organization.

In Figure 34 Huber's (1991) view of the constructs and processes in organizational learning is presented. The highlighted issues in the figure reflect the issues that were discussed and dealt with in this thesis. Weak signals can be applied to many roles in the futures learning process of an organization. For example, they can give new views to employees about the possibilities for futures by directing observation in new directions (Neisser's perceptual cycle). Also they can push the organization into rethinking their current belief system of what is likely to happen in the future. Weak signals therefore have a critical role in the strategic foresight process and in strategy making. Furthermore they can be used as raw material for scenarios in strategy processes (Day & Schoemaker, 2006).

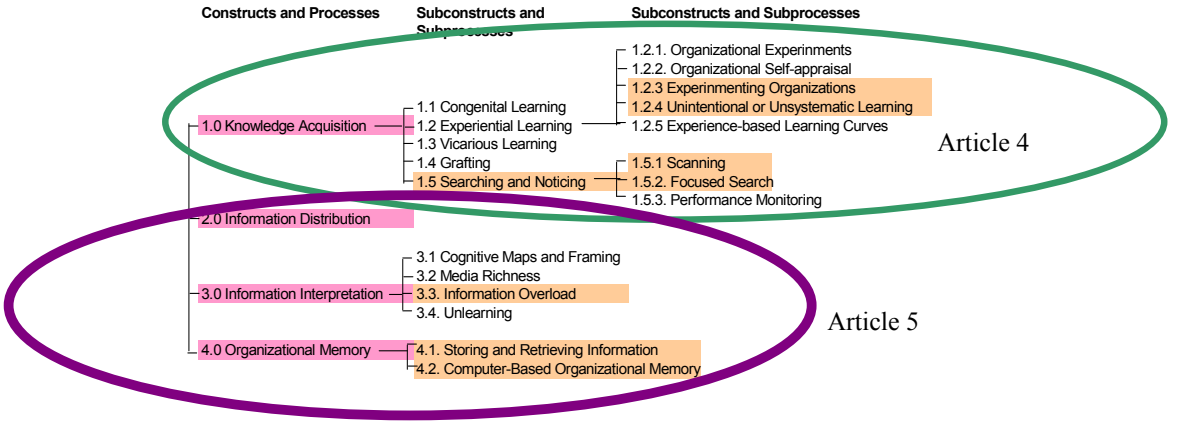

Figure 34. Constructs and processes associated with organizational learning. (Source: Huber 1991: 90). The highlighted text points to the issues that were dealt with in the articles of this thesis.

With reference to Figure 34, this thesis focused on weak signals from the perspective of knowledge acquisition, particularly with regard to searching and noticing, and scanning and focused search. Also, the thesis examined the information distribution, interpretation and organizational memory.

This thesis provides an answer to the first part of the second research question: where to scan for weak signals, the answer to which was gained by asking the futurist globally for their ways and sources to scan weak signals. An outcome of this study - a list of preferred sources that experts in futures use when they are scanning for future changes -provides some hints to organizations about where to direct their antennae, when trying to see tomorrow's possibilities and threats. A further outcome of the study was the importance placed on the need to scan the scanners i.e. people whose interests lie in scanning the changes in the environment. Further, the study reviewed some of the comments made by futurists concerning how weak signals could be spotted effectively. These comments

include interaction, openness and discussion, all of which were emphasized. This involves keeping one's eyes open, and having a sensitivity for change, creativity, receptiveness, intuition and a curious mind. From an organizational futures learning perspective, the list of preferred sources for weak signals can serve to reorganize the mental models of the individuals (including managers) in the organizations. This enables them to redirect their scanning of the environment toward new, perhaps more weak signal rich sources of information. Further, through social interaction these new ways of thinking can be shared in the organization. New mental models (particularly the managers') can lead to renewing in the organization.

Another issue that organizations should consider is that although article 4 listed good sources of weak signals there were some sources that were not mentioned by the respondents of the research. New sources are developing all the time and there is a need to have an open mind on these sources. For example blogs; so called "internet diaries" might be valuable because they are usually written by "amateur experts" i.e. people that are interested in some topic to the extent that they are experts even though they might not have formal status of an expert. These amateur experts are keen on all aspects of change that happen in their own area of expertise and they are willing to write almost instantly about these things in their blogs. Another good aspect of blogs is that they comment on the smallest things in life, which might not necessary be more widely published in magazines because these kind of publications have filters leading to a tendency to publish only important issues (trends). Blogs do not have such filters and thus they can include weak signals. Blogging activity has become more popular amongst writers and readers and therefore it is starting to have more effect on our society and business life. Organizations cannot afford to miss this important source of information. From the global operational environment perspective, blogs are convenient, because of the variety of the nationalities of bloggers, who write in English about their home country's issues. In this respect scanning the blogs or bloggers is scanning the scanners.

For disseminating weak signals in organizations this thesis introduced a tool, the Futures Window. The tool provides a solution of practical use of weak signals in organizations. The Futures Window can be used inside organizations to enhance organizational learning in various ways. Firstly, it is a tool that enables all the people in an organization to participate in the foresight process by sending images of weak signals to the tool, and thus it encourages all the employees to spot emerging issues and think about the future. Secondly, it is a new way for information distribution inside an organization. As discussed in Chapter 2.3.3 visual stimuli are an effective way to draw attention, and thus the Futures Window helps to efficiently distribute information inside organizations. Thirdly, it helps with the problem of dealing with information overload; an extensive challenge when it comes to weak signals. This, to an extent, is a necessity, but at the same time this brings challenges – particularly resulting from the failure to notice the right signals because the focus is on other information. In visual form, weak signals are much more easily observed from the huge amount of other information that the employees receive. In addition, the employees are exposed to visual weak signals in informal settings (like a cafeteria), an environment where adapting to this new kind of information is much easier and rewarding, and can lead to further discussion and analysis. Fourthly, The Futures Window is a medium for organizational memory. This is because all the visual signals sent to the tool are stored in a database and thus are easily retrievable from a database (weak signal "memory").

The Futures Window facilitates the process of social interaction and knowledge sharing in an organization. It also turns tacit knowledge (employee's small observations of new things, which they send as weak signals to the Futures Window) into explicit knowledge, which is a part of organizational knowledge creation (see Nonaka & Takeuchi, 1995). The Futures Window also provides a way to inspire employees to think about the future by using non typical ways to work in the organizations (particularly when employees can send their own images to the Futures Window). A flexible attitude to the Futures Window, allowing employees to "play" with their weird observations, facilitates playfulness and fun and thus breaks down the sole reliance on "formal" ways of working.

Unfortunately in this thesis there was not a possibility to test the Futures Window as the original idea was; to spur employees in the organization to spot weak signals and send images of them to the Futures Window for everybody to see. Of course there is a danger of an overload of weak signals in the tool or having images of issues that are not weak signals. That is why it is essential that there exists a person, a futures' reporter that is ultimately responsible for all content that is shown in the Window.

The role of employees in spotting the weak signals should be emphasized inside organizations. Employees are the eyes of an organization and they can spot weak signals as indicators of forthcoming change. They should be encouraged to spot and report such signals. In global organizations weak signals are particularly needed from across the world. This means than global organizations require an even wider scope of scanning for the future than companies operating only in the domestic markets.

Organizations should also take into account that in order to increase their capability to anticipate change by using weak signals they should understand that weak signals can be utilized, not only for anticipating futures, but also for creating futures too. The Futures Window is a good tool with which to do this. Novelty images (visual weak signals) encourage employees to innovate futures by breaking their mental models through the use of novelty images as stimulus. Using the Futures Window in brainstorming sessions for new product/service development can provide interesting results. Therefore it is a method to be recommended for organizations.

6.3 Further suggestions for organizations in using weak signals to anticipate futures

Finally, organizations should bear in mind that they can affect the future and innovate futures. Frequently society relies on even a single individual to be the instigator of change (consider examples as diverse as Gandhi and Elvis Presley). Within organizations there is a

need to exploit the potential of tens, hundreds, thousands or tens of thousands of employees who can contribute to affecting change.

Weak signals are not only related to the futures learning process, but they also play an essential role when it comes to defining and testing the strategy of an organization. Figure 35 refers to the relationship of weak signals and strategy.

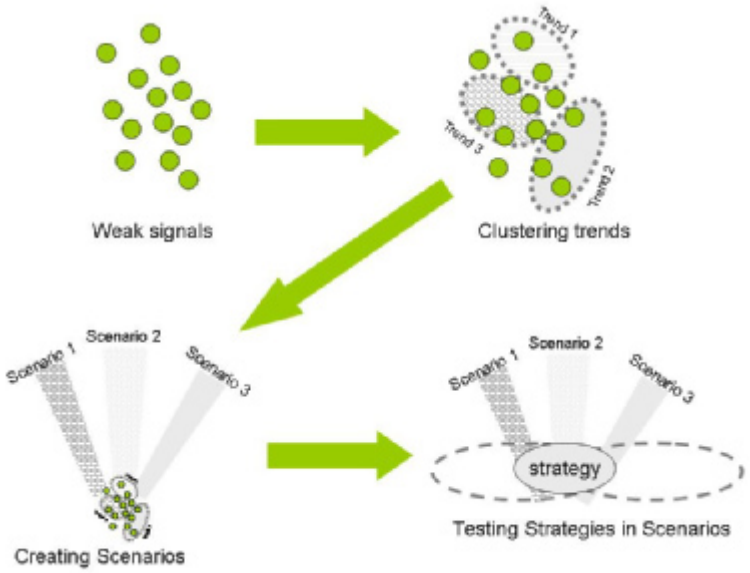

Figure 35. Weak signals and their link to strategy work.

For the strategy process weak signals are collected by employees of the organization. A single weak signal does not tell much us about the future, but a number of weak signals that are all pointing in the same direction might tell something about emerging trend in the future. Thus, the second stage in the process is to cluster weak signals into potential trends. With this trend material it is possible to create scenarios of the future by using various

emphasizes and the speed of the trends. With these alternative scenarios it is possible to test the applicability of strategy in the various situations and think in advance of the flexibility of the strategy in various situations.

6.4 The contribution of this study to the disciplines of futures studies and organizational learning

This study contributes to the disciplines of futures studies and organizational learning. The thesis covered conceptual definitions of weak signals. Ansoff, Molitor and Coffman have particularly contributed to the discussion of weak signals and emerging issues. The discussion has also been active in Finland. This thesis adds to the previous discussion by introducing and presenting the concepts: the future sign and the signification process. These concepts provide additional ways of managerial thinking in order to look at change by discussing the actor's role in these processes.

The study provides a unique standpoint for organizational learning because it combines foresight practices to learning in organizations. The tool, created in this thesis which is aimed at organizational learning of future's threats and opportunities, the Futures Window, provided positive results in the tests. The Futures Window has since been used in multinational companies and has also been exhibited at the Health and Wellness fair 2008 in Finland (Figure 36). Although this did not include employee participation a slide show type presentation did trigger people's futures thinking. Futures Window has also been an inspiration for a bachelor's thesis by Sirviö (2009) about using blogs in education.

Figure 36. Futures Window in Health and Wellness fair, Finland.

From the theoretical perspective weak signals were also combined with the theories of organizational learning (e.g. Nonaka & Takeuchi, 1995, March & Olsen, 1976 & Argyris & Schön, 1978) especially from the information perspective (Macdonald, 1995). Organizational learning is a prerequisite for organizational renewal and reshaping organization's strategies. Strategy has been discussed in the literature over many decades (see for example the work of Ansoff, Porter, and Minzberg) and has established a position as an essential tool for organization. Strategic foresight methods, such as the scenario approach have also been increasingly applied by organizations recently (see for example Ringland, 1998). However, weak signals as a tool for anticipating and innovating futures in organizations have not been applied much. This study contributes to this practice.

El Sawy (1985), Neufeld (1985) and Hines (2003) have emphasized the importance of environmental scanning in organizations. Furthermore Doz et al. (2001) have emphasized the importance of sensing the environment as a means for metanationals to cope with the competition. This thesis (article 4) gives practical hints for corporations about sources for scanning the environment.

This study gives also practical hints to organizations for anticipating and creating futures and to deal with weak signals. Good sources for weak signals that can be usefully added to an organizations' scanning list in order to look at futures are found in this study. These sources are the outcome of a study in which the participants were international futurists, a group that are considered to be experts at looking at futures. The key recommendation for organizations it to "scan the scanners"; futurists are members of this group.

The published articles of this thesis have also raised some interests of the international futurist community. The model of the future sign has been used in the EU funding application process of the *iKnow project*- a joint European project of various institutes interested in the identification of weak signal tools. This application has been accepted and the project started in autumn 2008. The new concepts in weak signal thinking, presented in this study, have been presented in at least seven recent international conferences and seminars (WFS Conference 2006, European Futurist Conference 2006 and 2007, Future Management Groups' Conference 2007, CostA22 Conference 2007, World Futures Studies Federation's Conference 2008, and the European Foresight Monitoring Network's Conference 2008). In addition the work has been discussed at international seminars in Finland. Finally this research work has led to the invitation from the World Futures Society to join the Editorial Board of Future Takes magazine as a weak signal editor (autumn 2008), and also the board of the European Futurists Conference.

The organizational futures learning OFL thinking has also lead to one software application, which facilitates organizations in collecting weak signals, analyzing trends and creating scenarios. The core idea of the software, called TrendWiki, was co-developed by the author

of this thesis and CEO of Data Rangers, Dr. Sampsa Laine. This software is now used in some of the larger Finnish companies and public organizations. The software is based on the idea that everybody in the organization has a chance to send their observation of weak signals to the TrendWiki database. Sending signals is made easy and simple for the participants. The nature of the software makes it possible to combine signals into trends, evaluate the trends, tag them, search for them etc. It is possible to analyze all the qualitative data in quantitative form by using the text and datamining tools of Data Rangers, which is currently the owner of the software. Figure 37 shows the outlook of the first version of this software. The main page of the software also utilizes the idea of Futures Window, by showing the images of the weak signals and trends in it.

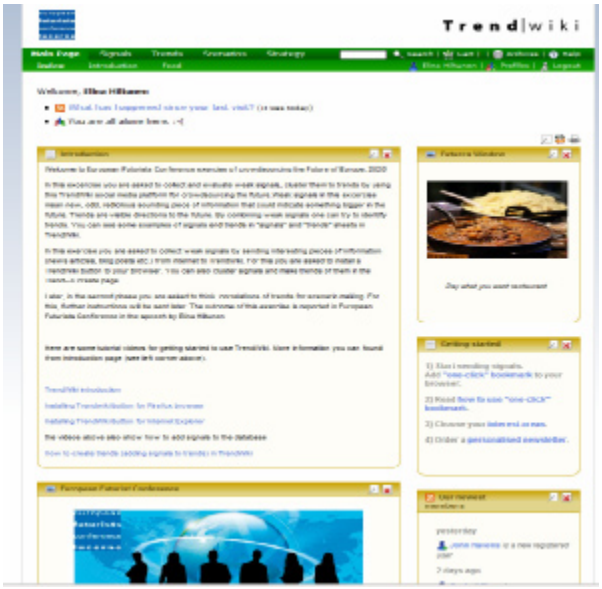

Figure 37. Outlook of Trendwiki software, version 1.0- a tool for collecting and analyzing futures information.

6.5 Limitations of the study and suggestions for further research

Studying and writing a thesis is a process where one's thoughts about the topic matures during the process, as one focuses on the issue over a long period of time. In addition, performing research and the findings of such research opens the world for new questions and interesting topics for further study. This has certainly happened in this process of writing up this thesis.

In this study there exist some limitations, which are discussed in this section. This study had a main focus on analyzing the theoretical concept of weak signals, which can be seen in the number of the articles dealing with this issue (3 out of 5 articles). Organizational futures learning, a new concept introduced in this study, was examined from perspectives of sources for weak signals and disseminating (visual) weak signals. A broader view of OFL could have been addressed, but for this study the two focus areas were selected. There are three reasons for this. Firstly, getting access to organizations to study their futures learning process was not possible in this study. Secondly, the heavy emphasis on the conceptual clarification of weak signals took too much time and energy during this study and left less time for focusing on organizational futures learning. Thirdly, at the starting point of this thesis, when the study format was designed, organizational futures learning concept did not yet exist. It was a result of the processing of the outcomes of the five articles of this thesis.

Even though the five articles were published, some further development with these topics could be useful. Combining the semiotic perspective for futures studies discipline (Articles 2 and 3) certainly gave some new insights. There are some important contributors, like Michael Foucault and his student Michael Shapiro, and especially his work on the politics on the sign, which could provide a deeper understanding of the signification process. Also the poststructural, critical futures thinking could open wider possibilities for utilization of the future sign. Combing Causal Layered Analysis to the future sign thinking could be one of the further research topics.

The tool Futures Window that was presented in this thesis needs to be further developed and tested in wider organizational context. Now it was tested only in one organization, which could be defined as a research organization. The use of the Futures Window, in which the original idea was to crowdsource visual weak signals from the organization, could be one of the next research topics as well.

As some questions were answered by this study, other questions emerged during the process. Some of these topics are worthy of further investigation. For example, it would be interesting to examine how organizations could collectively collect weak signals and how they would make sense of the future out of the weak signals. A deeper study and analysis of this topic could provide interesting perspectives that might contribute new methods and tools that would have organizational utility in foresight work. A "side product" of this thesis was a new tool, TrendWiki, which can be applied in an organizational environment for collecting and analyzing weak signals. Further research about the use and benefits of TrendWiki could lead to possible enhancements of the software so that it would fit better in organizational contexts.

Furthermore I consider the future sign and its signification process are starting points - seeds for discussion - in terms of their theoretical contribution to weak signals. It is hoped that the conceptual articles presented in this thesis will be an inspiration for other researchers to pick up this thread and further improve the thinking of weak signals. Also, engaging poststructural thinking (e.g. CLA) to weak signals, would add more value to weak signal discussion. Using CLA will provide multiple layers for finding and analyzing weak signals. Testing this in couple of cases could bring new methods for weak signal thinking.

This study lists some sources for weak signal spotting. During the last years, the importance of social media have increased. Its meaning for weak signal spotting is also important. Media like Twitter and Facebook have again, changed the rules of the game of information sharing. A study defining the meaning of social media from the point of view

of futures studies and weak signals could add valuable insights to the information source perspective.

In this thesis weak signals have been linked to the process of scenario creation and strategic foresight. Weak signals can also be used in various other areas of the organizational environment. A possibility is to use them as a basis for roadmapping, which has become popular way of companies to think about the future. Further research that links the roadmapping technique to weak signals is recommended.

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APPENDIX 1.

Definitions of weak signals by Finnish futurists and critique to weak signals

There are various views regarding the characteristics of weak signal in the literature. Usually in the consulting field these issues have not received attention, but more recently some researchers, particularly in the field of futures studies in Finland, have been active in examining the variety of views of weak signals. Discussions about the characteristics of weak signals in Finland were initiated by Kuusi et al. (2000)[8]. They conducted a Delphi study, in which the participants (leading futurists in Finland) were asked about their views of the characteristics of weak signals. Two conflicting definitions for weak signals were put forward by the Delphi panel according to characteristic preferences; in this study they were referred to as "weak future signals". These definitions were labeled "the most supported weak future signals", which was formed from the characteristics that were most preferred by the participants. The "anti-definition of weak signals" was formed from the characteristics that were least preferred by the participants. The definitions were as follows:

The most supported weak future signal:
"A weak future signal is an early warning of change, which typically becomes stronger by combining with other signals. The significance of a weak future signal is determined by the objectives of its recipient, and finding it typically requires systematic searching. A weak future signal requires: i) support, ii) critical mass, iii) growth of its influence space, and dedicated actors, i.e. 'the champions', in order to become a strong future signal, or to prevent itself from becoming a strong negative signal. A weak future signal is usually recognised by pioneers or special groups not by acknowledged experts" (Kuusi et al., 2000:80).

[8] This article was co-written by Kuusi, Hiltunen and Linturi

An 'anti-definition' of weak future signal:

"It is crucial for the credibility of a weak future signal that it comes from acknowledged experts, and those experts are also most able to recognize weak signals. A weak future signal is not dependent on an interpreter, i.e. it is an objective phenomenon. The weak future signal anticipates processes that have radical impacts on future and it typically includes a sign, which needs to be seized immediately. An important weak future signal strengthens by itself over time, since it is an early warning of a general rising trend" (Kuusi et al., 2000:81).

The Kuusi et al.'s (2000) study was criticized by Moijanen (2003), who noted the inconsistency in the definition of weak signals. She commented that the only characteristic of a weak signal commonly accepted among researchers is that it is the first sign of a possible change in the future. On the basis of the (mainly Finnish) literature on weak signals examined by Moijanen, she concluded that the researchers have defined weak signals in three ways: in the broadest sense of the term, several simultaneously affecting phenomena and consequences significant for understanding the general objectives of future studies are, in theory, included in the weak signal. Defined more narrowly, a weak signal is in itself a changing phenomenon. In the strictest definition, a weak signal is a sign that preindicates future changes. This issue is considered in more detail in Article 2 of this thesis. One of the main purposes of that article was to address Mojanen's (2003) -and others- critique of the fuzzy definition of weak signals by developing a new meta-level concept, the future sign, to better understand weak signals, emerging issues and the relationship between them.

Various dimensions of weak signals have also been discussed by other researchers. Rossel (2007), for example added to the critique of the definition and use of the concept weak signal. He discussed several problems. The first concerns how we know that we are in front of a weak signal and that it is precisely a weak signal (and in the most cases a signal of what?). The second problem is that in the identification of a weak signal and its interpretation as early expression of change, we may introduce our own vision,

interest and expectations. He commented: “For near-real time changes or emerging processes, we are literally part of our observation and have to deploy specific efforts to distinguish what might happen from what we hope (or fear) to happen” (Rossel, 2007:3). Rossel also questioned Shannon-Weaver’s information theory as a basic assumption in weak signal discussion. He stated: “There is in fact no one, no object, no phenomenon ‘sending messages to us’, which we are supposed to capture” (Rossel, 2007:3). For Rossel (2007) the key question concerning weak signals was that if it is possible to create—oneself- an efficient epistemic distance with our own pre-concepts and paradigmatic limitations? He recommended the use of meta-framing, which includes for example making assumptions as explicit as possible and part of weak signal identification process itself, in order to put weak signals in perspective.

A central theme of the criticisms of weak signals is that there are various views of their characteristics. Appendices 2-4 attempt to enlighten the different aspects and views of the characteristics of weak signals.

APPENDIX 2.

Is a weak signal a sign of emerging issue or the issue itself?

One of the central issues concerning the nature of weak signal is the question of whether weak signals are signals of emerging issues or whether they are the emerging issues themselves. The terms early warning signals and emerging issues that are sometimes used as synonyms for weak signals, describe well the various views of this issue. Ansoff and Coffman have mainly categorized weak signals as events and developments - in other words closer to the idea of emerging issues. In examining information theory, and the term signal, Coffman (1997b) revealed that by signal he means more than its meaning that is found in the information theory perspective. "We'll take a boarder and metaphorical view, and call a signal an event in which some living system or other element in the environment transmits a message in the course or as a result of its actions or behavior". In addition to Ansoff and Coffman other researchers have agreed with this view. For example Van der Heijden (1997), Åberg (1996), Mannermaa (1999a), Harris & Zeisler (2002) and Schulz (2002) have linked weak signal to an event, a new phenomena or an emerging issue.

Working in the field of communications Åberg (1996:247) linked weak signals to the first symptoms of changes. By symptoms he referred more to events, giving examples of weak signals with regard to the company environment: *the demand of products or services is declining or increasing, the quality of work of subcontractors is getting weaker, and advertising of competitors is increasing.* Schultz (2002:slide 5, note of the slide) commented that " …'weak signal' or 'emerging issue' or 'seed of change': these terms are used by different futurists, but they all mean essentially the same thing: the sources of change- the first case; the original idea or invention; the watershed event; the social outliers expressing new value- that is, a sign of change that exists so far in only a few scattered instances, which might multiply into enough data points to constitute a trend. You might say that an emerging issue is a trend with only one or two cases…"

According to Harris & Zeisler (2002) weak signals are small events that have the potential to make a big difference. Accordingly, they have connected weak signal to potentially significant impacts. Mannermaa's (2004) view is close to this. He defined weak signals as phenomena, that are spouting and that do not have a recognizable past. He also stated that "as a phenomenon, weak signals typically have low probability of taking effect and huge potential of influencing" (Mannermaa, 2004:44). In earlier work Mannermaa (1999a) used the term wild cards as a synonym for weak signals. This has raised confusion because more commonly these concepts have different meanings for other researchers (see for example Mendonça et al., 2004). This dilemma has provided the motivation to discuss the differences of weak signals and wild cards in this thesis (article 1).

There are some researchers that have a slightly different view of weak signals. Moving beyond defining weak signals as events, they include the notion of future oriented information. For example, de Brabandere (2005) did not link weak signals as a phenomenon or an event in such a clear way. He commented that weak signals are little pieces of information that can save a business, if taken into account. He viewed minor defects, dissonance, serendipity, paradox and boredom to be situations where weak signals could be sought. Blanco & Lesca (1997:3) described weak signals in the following way: "weak signals are defined as future-oriented information, premises of potentially important changes." However, their example; the hiring of highly specialized engineers by a competitor, which may mean that the competitor is at the beginning of the development of an innovative products , is a combination of both aspects; in other words both events and signals. Webb (1987:14) clearly separated the emerging discontinuity (emerging issue) and weak signals*:* "As the discontinuity commences to occur, it will emit signals- which, because they are being sent out at the start of the change, will necessarily be weak."

In a study relating to project management Nikander (2002) combined issues and signals in his views of early warning signals (which he used as a synonym for weak signals). His perspective is presented in Figure 38, which clarifies well the problem and variety of understanding of the definition of weak signals. Nikander (2002:117) commented

that "…observations made of phenomena or phenomena [sic.], that can be observed in projects, are either interpretable as 'pure' early warnings of a problem, or express an existing problem, or are interpretable as causes of problems, but that are difficult to interpret in more than one way in the same time". Thus, Nikander is one of the few researchers who has examined the various ways to interpret the concept of weak signals (early warning signals), and his work can be said to been one source of inspiration for the concept of the future sign (see Figure 24).

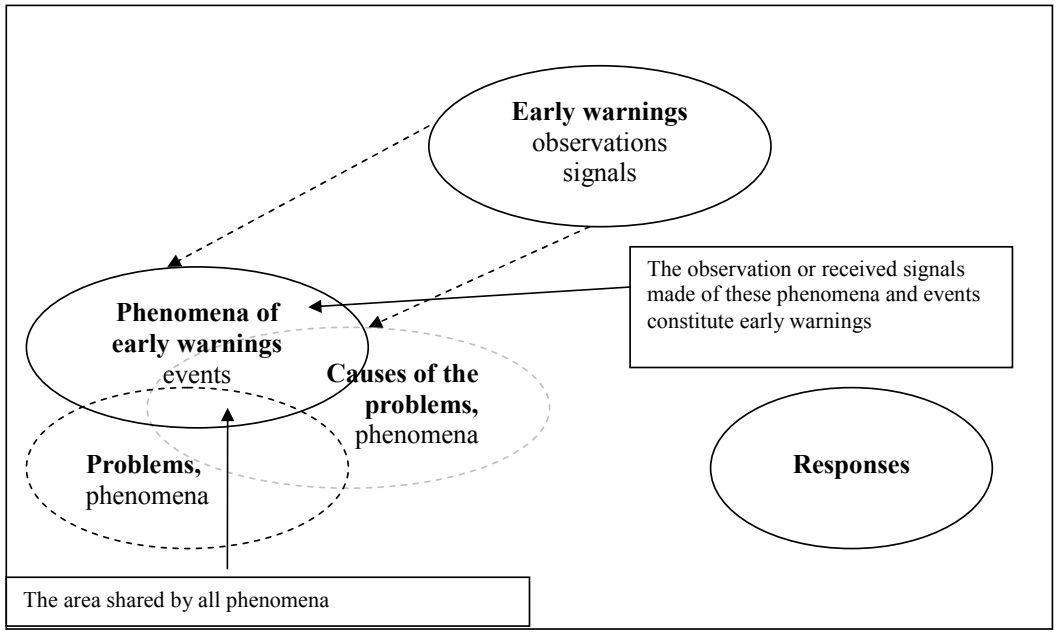

Figure 38. The sets of early warnings, problems, causes and responses (Source: Nikander, 2002:118).

APPENDIX 3.

Objectivity of weak signals and their relevance to the receiver

The matter of the objectivity and subjectivity of the signals is only briefly discussed in the literature and usually in the form of interpretation and relevance of the signals to the receiver. One of the points raised in Kuusi et al.'s (2000) Delphi study of the characteristics of weak signals was that *the weak future signal is not dependent on the interpreter of it and consequently it is an objective phenomenon*. This statement concerning the subjectivity versus objectivity of the signal was not supported by the majority of the respondents of the study (note: in the study signals were equated with phenomenon, and this was criticized by Moijanen (2003)). In other words, the Finnish futurist that participated the study considered a weak signal to be subjective *(if it is new and surprising to me then it is a weak signal)*. The subjective nature of the signals is also supported by Rossel (2007), who emphasized the importance of our interpretation of weak signals. He underlined that we add our own hopes and fears during the interpretation of weak signals and our perception of environment makes us label something odd or new (as a weak signal). In his study about weak signals in newspaper articles Uskali (2005) supported this view: He has considered the concept a *hunch* to describe weak signals; "…The reporter's own feeling that there is something happening out there. Almost impossible to articulate in words. No named sources telling/sharing the same feeling" (Uskali, 2005:7).

Linturi (2003) also considered the objectiveness of signals. In his view, a weak signal is real and objective even then when it is considered to be different in people's consciousness and even if nobody notices it. Linturi differentiated two aspects of the weak signals dilemma: what is objectively happening and how we interpret and feel about it. However, he (2003: internet source) linked weak signals to phenomenon (signal of a phenomenon) when writing: "A phenomenon is objective, but only receiving it makes it a weak signal and interpretation of it is made by a receiver." This perspective has also contributed to the basis for *the future sign* that is introduced in this thesis.

The relevance of the signal is an issue that can be brought into the discussion of the objectivity/subjectivity of signals. Potential relevance is a key component of how van der Heijden (1997) described weak signals. According to this author weak signals are "events that are observed and which reach our consciousness because we intuit that they have some relevance to our situation" (van der Heijden, 1997:11). However, by considering the relevance of the signal the problem of information filtering (especially mental and power filters) is compounded. On many occasions the signals that appear to be irrelevant for the organization are those that turn out to be important to future change. For this reason future relevance cannot be too much emphasized, because of threat of not seeing the various possibilities of the future.

APPENDIX 4.

Discussion of strength and strengthening of signals

An interesting dilemma is also how to determine the weakness of a signal and what determines whether a signal should be labeled weak or strong? In the existing literature there is a fairly coherent view that the weakness of a signal is linked to the difficulty of interpreting and giving meaning to it. Van der Heijden (1997:11) described weakness in the following way: "The notion of 'weakness' in this context refers to our inability to give meaning to them, which contracts with 'strong' signals that we understand clearly in their potential implications". Harris & Zeisler (2002:4) had a similar view: "Weak signals are weak because they are easily obfuscated by other factors, including current mindsets, attitudes, and biases of those involved in the search for the future." De Brabandere (2005) shared this perspective and stated that weak signals indicate a mismatch between our assumptions and the real world. Saul (2006) also took a similar position by commenting that signals are weak because they are inconsistent, open to many interpretations and often rejected by credible people in positions of authority. He also linked weakness to the words confused, contradictory and arguable. Ruuttas-Küttim (unpublished paper) added an interesting perspective to the weak signal discussion, that of semiotics. She claimed that "The very thing that distinguishes strong signals from weak ones is, that the first has clear context and the latter does not (yet). Context includes the circumstances and conditions, which 'surround' the event". Ruuttas-Küttim encouraged futurists to combine different contexts to weak signals in order to see their real potential.

If the meaning of a weak signal is something that is difficult for us to understand, a strong signal, as a contrast to the weak signal, should be something whose meaning is clear. Questions related to this issue are how does a weak signal become a strong signal or even whether a weak signal turns into strong signal at all, and does a combination of weak signals equal a strong signal. A common opinion concerning the strengthening process of weak signal is that combined with each other they form clearer patterns; these are strong signals (Kuusi et al., 2000). For example Ruttas-Küttim (unpublished paper) commented that weak signals grow strong by combining with other signals and

trends in certain way. Ansoff (1982) provided a practical example of the strengthening process of weak signals. He suggested that every event goes through a succession of levels of knowledge. The earliest indication is *sense of turbulence*, an example of which was that sensed in the field of electronics in the 1930s. In the next stage the *source of the challenge is known*; which in the case of electronics could be connected to the solid state conduction of electricity in 1940s. In the third stage the *sources of challenges become concrete*. In the case of electronics this meant the prototype transistor developed by Dr. Shockley and his associates in the Bell Telephone laboratory. In the fourth stage the *response strategies are developed,* which in this example meant companies like Texas Instruments developing the manufacturing technology, identifying potential markets, and developing commercially marketable transistors. In the final stage the outcome *of response strategies become forecastable*. In Ansoff's model signals (or events) are accumulated and thus turn into strong signals; these signals are more understandable to us.

Coffman (1997d) divided the growth of weak signal into four phases. First, there is series of high potential waves (weak signals) in a high uncertainty environment. Then, the probabilities collapse into a single event that has value. A collection of signals becomes autocatalytic and forms an ecosystem - Coffman listed as an example the automobile and components linked to it, such as petroleum products, roads and regulatory systems. In the last phase, the growth becomes exponential; the weak signals cross the threshold of noise in the society and become strong signals. Here, Coffman's (1997) thinking, to a great extent, resembles the views of Molitor (1977).

Even though there are various views concerning the way that the weakness of a signal could be measured (e.g. visibility, number of cases, the difficulty of interpreting it and give meaning to it), there are no methods to measure the absolute strength of a signal. Unlike the natural sciences where measurement can be precise (e.g a radio transmission signals) here signal strength is a more abstract concept and measurement is fraught with difficulty. Article 2 of this thesis discusses the weakness of the signals, which is measured by visibility. Even though it may be possible to theoretically measure signals after the event (for example by the air time that the issue received on TV and radio), at

the time that the signals start to emerge there is no knowledge of how the issue that the signals are describing, will develop (for example Ansoff's example of the transistor). Thus, when discussing weak signals the concept should always be taken as something indicative, rather than an absolute certainty.

From on the discussion described above it is possible to draw the conclusion that there is fuzziness about the definitions of the concept weak signal. Some researchers, such as Ansoff, Mannermaa and Harris & Zeisler defined it as an emerging phenomena. On the other hand other researchers such as de Brabandere and Blanco & Lesca defined the concept in terms of a piece of information. Linturi and Nikander are the main authors that have clearly sought to explore the various dimensions of the dilemmas associated with weak signals.

PART II: Articles

LIST OF ARTICLES

1. Hiltunen, E. (2006) Was It a Wild Card or Just Our Blindness to Gradual Change? *Journal of Future Studies*, November, Vol 11:2, pp. 61-74.

2. Hiltunen, E. (2008) The Future Sign and Its Three Dimensions, *Futures*, April, Vol. 40:3, pp. 247-260.

3. Kuusi, O. & Hiltunen, E. (2007) *The Signification Process of the Future Sign*, FFRC eBooks, Finland Futures Research Centre, Turku School of Economics, ISBN 978-951-564-510-4.

4. Hiltunen, E. (2008) Good Sources for Weak Signals: A Global Study of Where Futurists Look For Weak Signals, *Journal of Future Studies*, May, Vol. 12:4, pp. 21-44.

5. Hiltunen, E. (2007) The Futures Window – A Medium for Presenting Visual Weak Signals to Trigger Employees' Futures Thinking in Organizations*, HSE Publications*, working paper- w-423.

Note: The figures in the original article were mixed, but this version is corrected.

Was It a Wild Card or Just Our Blindness to Gradual Change?

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Abstract

This paper examines the different definitions of the term wild card. Most often the wild card is defined as a surprising event that has significant consequences. In the literature the examples labelled as wild cards do not always meet this definition. I have divided changes into two categories according to the rapidity of the change taking place: wild cards and gradual changes. By looking at the examples of wild cards in the literature, I found that a large number of them are actually gradual changes. This paper also clarifies the difference between wild cards and weak signals, which are sometimes considered synonymous. Weak signals are a means of avoiding blindness to gradual changes and wild cards in advance.

Key words: Future, Gradual change, Wild cards, Weak signals, Early warning signals, Emerging issues

Some dramatic, surprising events of the last few years, such as the terrorist attacks of September 11, 2001, increased interest in wild cards, particularly in the literature of the future research discipline. The attacks on the World Trade Center towers were a typical wild card: a surprising and widely impacting event that was difficult to anticipate. However, it may be questioned whether the event was, after all, so surprising. Would it have been possible to anticipate it by making wild card scenarios or spotting early warning signals (i.e. weak signals) of the event (Cornish 2003)?

The purpose of this paper is to clarify the problematic definition of the term *wild card*. This paper examines several authors' definitions of the term and discloses some similarities and differences between the definitions. Although there seems to be a mutual understanding of what a wild card is and what it is not, there is some fuzziness in this concept. This can especially be seen in the authors' listings of practical examples of wild cards. In this paper I divide the changes into two types according to the rapidity of a change: wild cards and gradual changes.

Using this division, some examples of wild cards mentioned by the authors are examined. This examination seems to suggest that some of the wild cards listed by the authors are not, in fact, that surprising. On the contrary, they are more gradual changes, which could have been anticipated well in advance.

Another problematic issue in the area of wild cards is the term *weak signal*, which is sometimes used as a synonym for *wild card*. Also referred to as *early warning signals* (or *signs*) or sometimes *emerging issues*, weak signals can however be viewed in another way: as a means of anticipating future wild cards (Mendonça et al. 2004; Petersen 1999). This paper strives to clarify the differences between wild cards and weak signals. To separate a wild card from a weak signal it is helpful to point out the essential aspect of these two concepts. Weak signals are currently existing small and seemingly insignificant issues that can tell us about the changes in the future. In other words, they are today's clues and signs providing us with hints of the possible events and trends in the future. With hindsight, it is also possible to point out the weak signals in the past that were hinting about future events and trends. For the future purposes, weak signals are, above all, a tool for avoiding blindness in foreseeing gradual changes and reacting to them in time. Collecting and analyzing weak signals could be a key to anticipating changes in advance and avoid letting them cause surprise. By contrast, wild cards are surprising events with huge consequences. They have either happened in the past or are ongoing right now. In regard to a futures perspective, it would make more sense to talk about wild card scenarios, which are scenarios dominated by an imaginary, sudden event with dramatic consequences. Some ways to avoid blindness in seeing the forthcoming changes are discussed in the last section of this article.

Some definitions for wild cards

Although wild cards have become more prevalent in the literature during the last decade, they are not new. They are closely connected to other terms like discontinuities (for different definitions of discontinuity and its connection to wild cards see van Notten et al. 2005), radical or surprising changes and critical events. Ansoff (1975:22) talked about a concept of "strategic surprise", which he describes as "sudden, urgent, unfamiliar changes in the firm's perspective which threaten either a major prof- it reversal or loss of a major opportunity." His concept of strategic surprise, to a great extent, resembles the concept of wild cards that has been presented later by futurists. Mendonça et al. (2004: 203) listed, from research papers, such synonyms for wild cards as disruptive events, structural breaks, discontinuities, surprises, bifurcations and unprecedented developments.

Wild Cards have been defined, for example, by Rockfellow (1994: 14), who specified a wild card as "an event having a low probability of occurrence, but an inordnately high impact if it does." When listing examples of wild cards, Rockfellow defined concrete premises for wild cards: they become evident by the beginning of the twenty-first century (i.e. in 6 years), the probability of such an event occurring is less than 1 in 10, and the events will likely have high impact on international businesses.

In his well known book *Out of the Blue: How to Anticipate Big Future Surprises*,

Petersen (1999: 4) suggests that wild cards are "low-probability, hi-impact events that happen quickly" and "they have huge sweeping consequences." Wild cards, according to Petersen, generally surprise everyone, because they materialize so quickly that the underlying social systems cannot effectively respond to them (Petersen 1999: 4).

According to Cornish (2003: 19), a wild card is a surprising, startling event that has important consequences. He continues: "Wild cards have the power to completely upset many things and radically change many people's thinking and planning." He underlines that the more extraordinary the surprising event, the more it qualifies as a wild card surprise in terms of upsetting our expectations. On the Futurist.com website, wild cards are defined as "developments on the horizon which are possible, and which, if they occur, will change everything." Mendonça et al. (2004: 201) define a wild card as "sudden and unique incidents that can constitute turning points in the evolution of a certain trend." They continue that a wild card is assumed to be improb- able, but it would have large and immediate consequences for organizational stake- holders if it were to take place. Mendonça (2004: 203) et al. see wild cards as "one of the most unpredictable and potentially damaging triggers of change of four conceiv- able components of change: trends, cycles, emerging issues, and wild cards."

Dewar (2003) does not talk about wild cards, but discusses about wild card scenarios, which he defines as less likely than other plausible futures. He adds that the wild card scenario would become important if the future it describes produced dispro- portionately dire consequences. Mannermaa (1999), on the other hand, uses the term wild card as a synonym for weak signal. He defines wild cards or weak signals as issues that are sprouting and do not have a history, trend or other recognizable past, but that can in the future become central phenomena or influential factors (Mannermaa 1999: 87). However, in his latest book, he no longer uses words weak signal and wild card as synonyms, but he nevertheless defines weak signals as if they were wild cards ["As a phenomenon, weak signals typically have low probability of taking effect and huge potential of influencing" (Mannermaa 2004: 44, translated by Hiltunen and Jääskeläinen)]. To draw conclusions from this discussion, one can notice, that wild cards are typically considered to be surprising (low-probability) and hi-impact events.

Practical examples of wild cards in the history and in the future

Most of the authors discussing wild cards give some examples of wild cards that have happened in history and that might happen in the future. Rockfellow (1994) mentioned three possible wild cards for the future: Hong Kong rules China, Europe goes regional and a no-carbon economy. Leaps from horse to car, pen to typewriter and typewriter to computer Rockfellow (1994) sees as wild-card events that already happened.

Petersen's (1999: 4) general example of a wild card is a major hurricane devastating a town in a day. He emphasizes that, for example, women's moving into the work- force in the 1950s was a major, unexpected development that had a great impact. Because it happened so gradually, however, it was not a wild card (Petersen 1999: 4).

In his book Petersen lists almost eighty wild cards (note: referred as scenarios in the

back cover of the book) that might happen in the future varying from shift of the earth axis to future prediction becoming a standard business. He also defines impact indexes that are based on seven impact factors, foresight factors and the quality of the wild cards.

Cornish (2003) mentions some examples of wild cards that could have been foreseen, but, nonetheless, came as total surprises. One example is German invasion of the Soviet Union in 1941. The Soviet Union was warned by the British of Hitler's planned assault, but Stalin ignored the warning. He also mentions the collapse of WTC towers in New York on September 11, 2001, as an example of wild cards.

Futurist.com lists nanotechnology, aeroplanes that fly themselves, and doubling one's lifespan as examples of wild cards. Mannermaa (2004) lists some weak signals, which can be interpreted as wild card scenarios, more on the basis of descriptions of the future state. The titles include for example "superintelligence of computers and networks," "fusion society", and "a human being will not die".

Discussion of the properties of wild cards

Although the authors' descriptions of the wild cards seem similar, there are, however, some differences and even confusions between them. For example, Rockfellow (1994), Petersen (1999) and Cornish (2003) use the term "event" in defining wild cards; whereas, Mendonça et al. (2004) use the almost synonymous term "incident". In Futurist.com wild cards are referred to as developments; whereas, Mannermaa (1999) defines them as sprouting issues; and Derwar links them with the word *scenario*. May (1996: 162) defines scenarios as outlines or sketches of major developments. Thus, one can detect disagreement concerning the duration of wild cards. An event or an incident refers to shorter duration, while a development is more time consuming, a result of developing.[1] It could even be argued that a development is a series of events.

Some of the definitions refer to the short duration of the wild card even more clearly. According to Petersen (1999: 4), wild cards are events that happen quickly, like a hurricane destroying a city, which entails that the duration of the event is short. On the other hand, with such examples as the shifts in the Earth's axis or rapid climate change, he also refers to the longer duration of the wild cards. Petersen (1999) also describes wild cards as surprises, because they materialize so quickly. Mendonça et al. (2004) also write about the abruptness of the wild cards, which seems to refer to the short time to prepare ourselves for the wild card. Mannermaa (1999) also agrees with this opinion, when emphasizing that wild cards do not have a history or recognizable past. Overall, there seems to be a consensus about the rapidity of a wild card's taking place.

The critical question about the wild cards is to whom they are wild cards. Barber (2006) introduced, for this purpose, the Reference-Impact Grid, "RIG", to estimate the impacts of wild cards. In the grid, he has divided the scope of impact and reference to personal, local, national, transnational, international and global level to estimate the impact level of a wild card.

Another critical question is how wild cards differ from scenarios. Why are wild cards not simply referred to as "wild scenarios" or "surprise scenarios"? Petersen

(1999), on the back cover of his book, and Dewar, in particular, are using the word scenario when referring to wild cards. I hope the the following discussion about the nature of wild cards and weak signals will clarify this aspect.

In order to distinguish between wild cards and weak signals, it is necessary to point out the differences between these two concepts. Weak signals, which are similar to emerging issues (see for example Dator 1996, 2005 and Molitor e.g. 2003), are currently existing small and seemingly insignificant issues and events that can tell us about the changes in the future. In other words, they are today's clues and signs that provide us with hints of possible events and trends in the future. With hindsight, weak signals providing hints about future events can also be indicated from the past. By contrast, wild cards are surprising events with huge consequences. They have either happened in the past or are happening at the moment. In regard to the future perspective, it would seem to make more sense to talk about "wild card scenarios" rather than plain "wild cards", as they are scenarios that are dominated by imaginary, sudden events that have dramatic consequences. The following figure illustrates the idea.

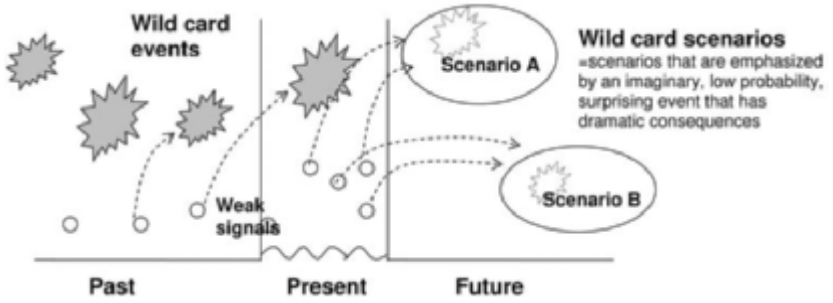

Figure 1: Wild Cards and Weak Signals in a Time Frame. Weak signals exist here today. With hindsight, it is also possible to point out weak signals in the past that were hinting about future events and trends. Wild cards are sudden surprising events that have happened or might happen in the present. Wild card scenarios are our images of a future state in which an imaginary surprising event has a dominating effect.

Is the term wild card valid within the futures studies?

The most challenging part in discussion of wild cards is the probability of its occurrence.

Some authors, like Rockfellow (1994) and Petersen (1999), label a wild card as a low probability event. This raises the question of whether there is a "normal future," which is more probable than some other less probable future indicated by wild cards? Then, a further question could be: Who tells us what a "normal" future is? In my opinion, our mental models and filters (see Ansoff 1984) restrict us to see all possible vari-

eties in the projected futures. It is, indeed, tempting to call events unfit for one's men- tal model either "impossible" or having a low probability of happening in the future. It becomes apparent that the characteristic "low probability" of wild cards comes from the restrictions of our mental models openness in regard to occurrence of these surprising events

The low probability characteristic of a wild card may have come into existence because scenarios have typically been divided into *possible scenarios* (everything that can be imaged), *realizable scenarios* (all that is possible, taking account of constraints) and *desirable scenarios* (which fall into the possible category, but which are not all necessarily realizable) (Godet 1993: 56). To investigate wild cards in this framework, low probability is a legitimate characteristic of a wild card. However, there might be another view to the future: *possible and realizable futures* include all the futures, even those futures that are not imaginable and not constrained (i.e. "nor- mal") to us. Using this rationalisation, the low probability of an event is not a valid characteristic of a wild card. As Dator (source: internet) wisely puts it: " 'the most likely future' is often one of the least likely futures." In my opinion, wild cards defined as rapid (and in that sense surprising) events that have vast consequences can be used in futures studies. The characteristic low probability does not fit to the definition of wild cards in my opinion.

Classifications of wild cards

On account of the dilemma of the duration of wild cards, I divide wild card events into irreversible and reversible changes (Table 1). Of course, when talking about reversibility of the system, the question is mostly related to time. For some changes to take the same values as in the original state prior to the wild card event, it might only take some months or years. These I categorize as reversible changes. If, however, it takes more than tens of years to restore the original state of affairs or it does not happen at all, I label the event as irreversible. Examples of these categories are listed in Table 1.

Table 1: Two types of wild cards

Wild cards	
Type of the wild card	*Example*
Irreversible	Shift of Earth's axis
Reversible	Stock market crash

The key issue, when considering wild cards and other changes, is the rapidity of the changes and, according to that, the time to react to them. In order to take these dynamics into account, changes can be divided into two categories: wild card type of changes and gradual changes. Both of these types are similar to S-curve type of

changes that for example Molitor (2003) and Dator (1996, 2005) have discussed earlier in connection with emerging issues. The difference of these two types of changes is the speed of the change (i.e. the slope of the S-curve).

In the case of wild cards there is only little time to react to the change before it takes place. In contrast to gradual changes, it is possible to anticipate them well in advance. It is understood that this division much resembles the division of discontinuities into categories of abrupt and gradual discontinuities described by van Notten et al. (2005). Although these authors do not use the term wild card in this sense, I assume that their "abrupt discontinuity" is very similar to wild cards while "gradual discontinuity" (or transition as they also refer to it) has some elements of the term gradual change that I use.

Following is an example of gradual change vs. wild cards change on a personal level: If a family member is diagnosed to have a fatal disease, like an incurable cancer, the family gets some time to prepare to the unfortunate fact of loosing a dear member of the family. This can be called a gradual type of change. On the other hand, an example of a wild card type of change could be a sudden, unexpected death, such as a death in a car crash or suicide, which gives the family no time to be prepared for the loss. Even though the result in both cases is the same (an empty spot in the family) there is, in the former case, more time to prepare oneself to the loss than in the latter case. That is why in the latter case, the change itself appears to be total surprise, a wild card.

Wild card and gradual types of changes are presented in Figures 2 and 3. For these figures I have combined ideas from Ansoff's "Interaction between forecasting horizon and response time" (1980: 367), Coffman's "Growth of weak signal in noisy channel" (1997b) and Steinmüller's "Life Cycle of a Wild Card" (2004).

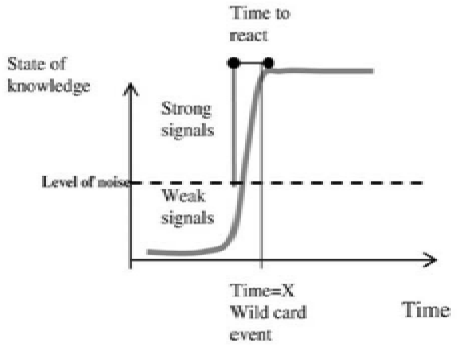

Figure 2: Wild Card Type of Change: a sudden change that gives little time to respond or be prepared for it. The level of noise in the figure refers to the level, above which the event is visible to the sizeable group of a concerned public. Above the level, one can notice strong signals. Below the level of noise, only weak signals of the change exist. The time to react is the time from when "an average" person can perceive a wild card happening (i.e. the level of noise exceeded) to the time when it actually takes place.

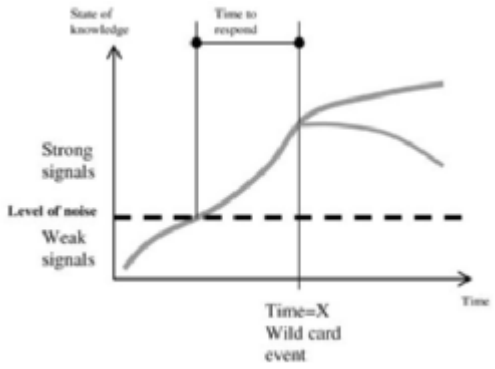

Figure 3: A Gradual Change: The change is taking place gradually and it gives more time to respond. The change has different possibilities to evolve after the time X (increasing, decreasing or keeping the same level).

In the light of the previous categorisation, this review classifies some of the wild cards mentioned by the authors.

As indicated in Table 2, most of the wild cards mentioned by the authors were categorised as gradual changes. Of course, it ought to be taken into account that the table of classification of the wild cards is not supposed to act as a quantitative study. Also, because the classification is complex and subjective, the table is not absolute. Rather, the purpose of the table is to show the tendency of pattern, which in this case is that instead of being actual wild cards most of the listed cases in fact more resemble gradual changes.

To question the general claim that the listed wild cards in the table are surprising events, another type of interpretation is presented. Although some of the listed wild cards possibly will happen or have happened quickly (i.e. they are classified as wild cards), most of the wild cards listed by the authors are such events that labelling them as wild cards would simply ignore their development, which could have been perceived. They are, indeed, more like gradual changes. They could have been anticipated (in case of historical wild cards) or signs of them could be seen at present (in case of possible wild card scenarios). Thus, it would be preferable to call these changes gradual changes that have surprised us because of our blindness to them. Of course, there is a great temptation to label a gradual change as a wild card that takes us by surprise if we have had problems in anticipating it. For example, in innovative technological developments, such as the change from horse to car in the past, or the potential doubling of lifespan, and thermal depolymerization in the future. Getting the new technology from the laboratory scale to everyday use takes plenty of time. Thus, it

Table 2: Examples of Wild Cards in the Literature

Wild card listed by authors	Possible wild card/ history wild card	Author	Type of the wild card WC=wild card GC=gradual change
Hong Kong Rules China	P	Rockfellow	GC
Europe goes Regional	P	Rockfellow	GC
Leap from horse to car	H	Rockfellow	GC
Leap from typewriter to computer	H	Rockfellow	GC
A hurricane devastating a town	P/H	Petersen	WC
Shift of Earth's axis	P	Petersen	WC/GC
Asteroid or comet hits the earth	P	Petersen	WC
Gulf or jet stream shifts location permanently	P	Petersen	GC/WC
Crashes of WTC tower, 9/11	H	Cornish, Mendonça et al.	WC
The fall of Berlin Wall (the reunion of Germany)	H	Mendonça et al.	WC/GC
Major stock market financial crash	P/H	Mendonça et al.	WC
Thermal Depolymerization (everything into oil)	P	Futurist.com	GC
Doubling the life span	P	Futurist.com	GC
The rights of robots	P	Mannermaa (1999)	GC/WC
A global multimedia monopoly	P	Mannermaa (1999)	GC

gives us time to react to it if we just keep our eyes open. It would indeed be implausible to call these kinds of changes wild cards.

It seems that what the so-called wild cards listed in table 2 have in common is their major impact on the system, whereas the surprise factor being a common feature is highly questionable.

Can wild cards be anticipated?

Some writers (Cornish 2003; Petersen 1999; Mendonça et al. 2004) claim that it is sometimes possible to anticipate wild cards in advance. I agree with these writers. For example, Cornish (2003) contradicts the surprise factor of the September 11 attack on the WTC towers. According to him, warning signs were all there before the attacks. As examples of these, he lists two articles in the Futurist: an article by terrorism expert Brian Jenkins who discussed about the possibility of aerial suicide attacks, and an article by forecaster Marvin J. Cetron, who identified World Trade Center as a choice tar- get from the terrorists' perspective. He also reminds us about the terrorist attack to the World Trade Center in 1993 that failed at that time. Corinsh (2003) concludes that

maybe the September 11 event could have been foreseen in scenario work. Mendonça et al. (2004) and Petersen (1999) also very clearly announce that signals of wild cards, most of the time, are available. Petersen (1999) calls these signals *early warnings or early indicators*, whereas Mendonça et al.(2004) calls them *weak signals*.

Mendonça et al. (2004) emphasize that wild cards can be anticipated by watching weak signals of them. They use Coffman's (1997a) definition of weak signals, according to which a weak signal is:

1. an idea or trend that will affect how we do business, what business we do, and the environment in which we will work
2. new and surprising from the signal receiver's vantage point (although others may already perceive it)
3. sometimes difficult to track down amid other noise and signals
4. a threat or opportunity to your organization
5. often scoffed at by people who "know"
6. usually has a substantial lag time before it will mature and become mainstream
7. therefore represents an opportunity to learn, grow and evolve

Mendonça et al.(2004). emphasizes that by scanning weak signals in the environment, some wild cards can be anticipated. For those wild cards that cannot be anticipated, organizational improvisation is needed for dealing with ongoing crises.

Petersen (1999) underlines that wild cards can sometimes be anticipated and assessed ahead of time. The key for that is careful, focused and objective observation with unusual new methods of accessing information. Thus, Petersen (1999) encourages people to think about wild cards now, to use effective information gathering and analysis processes for identifying early warning signs of wild cards, and to use extraordinary approaches to deal with them. He advocates having an input in this process from experts in systems behaviour, the Internet, complexity theory, and other "new sciences", as well as from many traditional disciplines. Listing almost 80 wild cards, he also lists early warnings that would seem to indicate the possibility of the wild cards to happen. For example, Petersen (1999: 46-47) lists several early indicators for the wild card "Gulf or jet stream shifts location permanently", such as the unusual periodicity of El Niño from 1990 to 1997, large variations in jet stream location over North America, and higher frequency and greater intensity of storms.

On the other hand, there are opposite opinions. Barber (2006) claims that with wild cards there are no advance warnings of the event and, therefore, impacts are sudden and widespread. However, he suggests that unlike wild card events, discontinuities can be anticipated and can be seen emerging.

When discussing the dilemma of anticipating wild cards and gradual changes, I refer to Figures 2 and 3. As Figure 2 shows, there is a short interval between the time when the first signs of the change become visible to the sizeable group of a concerned public (i.e. level of noise is exceeded) and the time of the wild card impact. The only thing we can do about anticipating wild cards is to try to look below the noise level (Coffman 1997b) in order to spot the weak signals. This can be done, for example, by using effective environmental scanning systems and focusing on extraordinary sources of information, like scanning the movements of minorities and activists of the society.

Avoiding blindness in seeing forthcoming changes

As discussed in the previous section, weak signals can pre-indicate changes (both wild cards and gradual changes) in the future. Because of the rapidity of the wild cards, weak signals are more difficult to use in anticipating wild cards than in the case of gradual changes (see Figures 2 and 3.). On the other hand, with the gradual changes, people sometimes tend to ignore the such weak signals. However, gradual changes should not be labelled as wild cards because of blindness to them and, consequently, of their big surprise factor.

If there are weak signals preceding the surprising events, why are not wild cards or even gradual changes recognized in advance? What is the thing that causes blindness for us to see the signs of future events? Ansoff (1984: 335) has presented a theory of information filtering (Figure 4) for this issue.

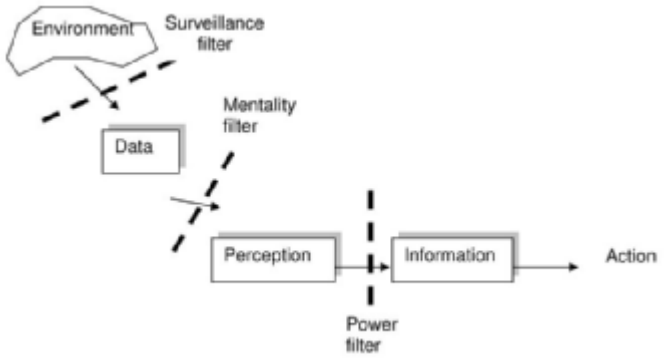

Figure 4: Filters for Information by Ansoff (1984: 335).

According to Ansoff (1984: 326-335), signals have to pass three filters: surveillance filter, mentality filter and power filter to be able to affect the decisions. In every filter some signals are blocked out and the rest pass the filter. For getting relevant information of the environment (including weak signals of the change), Ansoff (1984: 334) suggests that it is important to use techniques (environmental surveillance, fore- casting and analysis) that can capture the essential elements of the reality in case of surveillance filter. For broadening the mentality filter, the development of key manager's mentality, which will be responsive to future turbulence, is needed. A wider power filter calls for the appropriate mentality of powerful managers toward novel things.

Webb (1987: 12-14) also lists some reasons why signals are sometimes weak and difficult to recognize:

1) Signal is strong but the sensory apparatus are not capable to detect the signal.

2) The sensory apparatus is designed to detect particular signals, and thus it will not detect other signals, no matter how strong they are.

3) Filters interposed between the signal and detector attenuate the signal from its original strength.

4) The discontinuity that causes the signal may exist geographically too far from the sensor.

5) When the discontinuity commences to occur it will emit signals which will be weak at first.

In my opinion, trying to widen the filters listed by Ansoff (1984) for receiving signals is one way to get a better view of wild cards in the future. In organizational context, this can be done in practice by using a wider and even atypical range of information sources for environmental scanning and forecasting activities (i.e. widening the surveillance filter). Here, for example, Day and Shoemaker (2005) are emphasizing the importance of scanning the periphery to see weak signals of a change. Also, hiring employees from different disciplines and of different backgrounds (widening the mentality filter) and educating top manager openness to alternatives of the futures and to be ready to act differently if needed (widening power filter) are ways to be more open to weak signals in the environment. Ilmola & Kuusi (2006) have discussed widening the filters for weak signals in organization more precisely in their paper. Solutions posed by Ansoff's filters can be used to overcome the problems listed by Webb (1987).

Today, the possibility of using Internet sources for information gathering, greatly augments any shortage of weak signals. On the Internet, the voices of a wide range of people are accessible. Following the stories of the masses and especially changes in them is one way of anticipating forthcoming changes. This kind of *myth analysis* was successfully used by Shell in anticipating the forthcoming revolution in Iran (Åberg 1989: 251). Avoiding blindness for changes is achieved by searching signals of change with the curiosity of a child. These weak signals can be found especially from the periphery of the society. For avoiding blindness, the author shares two hints with the readers. Firstly, organizations, in modified terms of Star Trek, should: "boldly search signals where no man has searched before". Secondly, never say never in respect of future.

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Notes

1. A definition of the word *development* in Merriam-Webster on-line dictionary http://www.m-w.com/cgi-bin/dictionary , taken March 2, 2006.
Development (Function: noun)
a: the act, process, or result of developing b: the state of being developed
c: a developed tract of land; especially : one with houses built on it

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The future sign and its three dimensions

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Abstract

The topic of weak signals has raised its interest especially in Finland in recent years. Weak signals are current oddities, strange issues that are thought to be in key position in anticipating future changes in organizational environments. Scanning for them and using them in scenario work is thought to be successful for looking to the future. However, defining weak signals is problematic, and various authors term the concept differently. The debate about the characteristics of weak signals has been active especially in Finland. The article aims to develop a deeper theoretical understanding of weak signals. For this purpose, a semiotic approach, Peirce's triadic model of sign in particular, is used. The article introduces a new starting point for defining weak signals (signs) by using the novel concept *future sign*, which consists of three dimensions: the signal, the issue and the interpretation.

1. Introduction

Scholars, consultants and organizations have become increasingly interested in *weak signals*. This can be seen from the growing number of texts dealing with the topic (see e.g. Ansoff [1–5], Webb [6], Coffman [7–11], Blanco and Lesca [12], Harris and Zeisler [13], Day and Schoemaker [14]). The discussion has been active in Finland, too (see Metsämuuronen [15], Mannermaa [16–18], Hiltunen [19–23], Kuusi et al. [24], Nikander [25], Moijanen [26], Ilmola and Kuusi [27], Uskali [28], Brummer [29], Kuosa [30], etc.). During the last 2 years, at least two books on the issue have been published in Finnish [31,32], and some individual consultants as well as consulting companies in Finland are paid for working with weak signals. Owing to a wide variety of definitions by researchers and consultants, there is however, confusion about what weak signals actually are. Another challenge to the issue is caused by concepts close to weak signal, such as *emerging issues*, *seeds of change*, *wild cards* and *early warning signals* (see for example: Molitor [33], Dator [34,35], Nikander [25], and Petersen [36]). Some of these terms are even used as synonyms for weak signal (e.g. [16,25]).

The study of weak signals has focused on practical rather than theoretical issues. Outside of Finland, the characteristics of weak signals have been discussed mainly by Coffman [7–11], with other writers focusing more on applying weak signals in organizational environments (e.g. [1–5,12,14]). In Finland, however, some discussion about the characteristics of weak signals has been aroused (e.g. [16,20,24,26]). The discussion started from a paper by Kuusi et al. [24], which was criticized by Moijanen [26]. This useful debate has

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unfortunately remained unheard of by the international audience, since it has been written about only in Finnish. Thus, one aim of the article is to shed light on the Finnish debate about the characteristics of weak signals.

The main contribution of this article is *the triadic model of the future sign*, which is presented here for the first time. This model has been used in order to come up with an answer to the questions and critique raised in discussion about the characteristics of weak signals among Finnish scholars. The triadic model of the future sign is based on Charles Sanders Peirce's triadic model of the sign [37], which I consider to be applicable in its versatility to resolve some obscurity in the weak signal dilemma. As for the future, semiotics, which has only seldom been used in the discipline of futures research, could have much to offer for the discipline.

2. Discussion about weak signals in the literature

As early as 1975, Ansoff, who was among the first people contributing to the field of weak signals, wrote about the issue in order to overcome some problems in strategic planning [1]. Ansoff [3, p. 12] described weak signals as "… warnings (external or internal), events and developments which are still too incomplete to permit an accurate estimation of their impact and/or to determine their full-fledged responses." He [3,5] presented a matrix linking the signal strength and graduate response of a company. He has also contributed to evaluating the signal strength grading it to five categories according to its intensity. Ansoff's views of weak signals have been discussed thoroughly for example by Webb [6] and Nikander [25].

Besides Ansoff, Coffman is another person, whose contribution to the research of weak signals has been remarkable [7–11]. He has examined weak signals connecting them to information theory, cybernetics, complexity and self-organization. Coffman has also put emphasis on the practical aspects of using weak signals in the business environment. Several other authors have also considered the business environment and organizational viewpoints of weak signals (see e.g. van der Heijden [38], Day and Schoemaker [14], Brabandere [39], Blanco and Lesca [12], Lücken et al. [40], Salmon [41], Saul [42], Harris and Zeisler [13], Mendonça et al. [43], Neugarten [44], Mannermaa [16,31], Hiltunen [21,22], Åberg [45] and Ilmola and Kuusi [27]). The problem with the available literature is the variety of the definitions of weak signal. Also, some other terms like early warning signals [25, 46], wild cards [16], seeds of change [47], emerging issues (see Schultz [47], Molitor [33], Dator [34,35], Stevenson [48] and early indicators [36] are used sometimes as synonyms for weak signals. The characteristics of weak signals have not been exposed to thorough discussion in international literature. In Finland, on the other hand, the issue has rather actively been discussed about by Kuusi et al. [24], Moijanen [26], Pitkänen [49], Linturi [50], Uskali [28], to name a few. The discussion reveals the variety and obscurity of the weak signal's definitions, and a more general and universal model of weak signals is called for.

3. Future sign and its dimensions

Because of my work as a researcher of weak signals, I try to spot them while reading through my morning papers. One day there was a news story in a Finnish main newspaper, Helsingin Sanomat, about the fashion clothes shop chain Hennes and Mauritz (H&M). The article was telling that 12 H&M shops have taken second hand clothes for their collection. These clothes are sold under the title "vintage" and they are about the same price as the new ones [51].

This was news to me, and it pushed me to think of the dilemma of the definition of weak signals more thoroughly. In my mind I wanted to label this news story as a weak signal. The only problem in categorizing this piece of news as a weak signal was its visibility. Taking up one-fourth of a page in Helsingin Sanomat, a newspaper daily read by every fifth Finn, the problem in categorizing the piece of news as a weak signal was its high visibility. Being sure that many others too had noticed the story, I would not prefer labelling it as a weak signal. On the other hand, the phenomenon itself was new, since only about 1% of H&M shop[1] had "vintage" clothes for sale.

[1]According to H&M web pages, there exists 1196 stores around the world. (source: http://www.hm.com/corporate/do?action=factsandhistoryviewshortfacts, opened 31 May 2006)

The article was a real wake up call for me that pushed me to try to define the term weak signal more thoroughly. The problematic of the definition of weak signal has led me to search for help from a discipline other than organizational sciences and futures' studies: semiotics. Semiotics, according to Oxford Advanced Learner's Dictionary online, is "the study of signs and symbols and of their meaning and use" [52]. Danesi [53, p. 9] calls semiotics briefly as "a science of signs". Semiotics has so far been utilized only a little in futures studies and especially in the problematics of weak signals (Ruttas-Küttim's [54] article is a good example of using semiotics in future studies). The purpose of this article is to find a more general model of weak signals by using semiotics, especially Peirce's triadic model of a sign [37].

3.1. Triadic model of future sign

The first major contributors in defining a sign in semiotics were Ferdinand de Saussure (1857–1913) and Charles Sanders Peirce (1839–1914). Saussure has offered the 'dyadic' model of a sign. He defines the sign as being composed of the *signifier* (e.g. the form the sign takes) and the *signified* (e.g. the concept it represents). According to Saussure, the sign is a whole that results from the association of the signifier and the signified [55].

Peirce, on the other hand, has provided the triadic model of the sign (see Fig. 1), which consists of the *representamen*, the *interpretant* and the *object*. The representamen stands for the form, which the sign takes (not necessarily material); the interpretant is not equivalent to the interpreter but rather the sense made of the sign; and the object is to which the sign refers [57].

In order to deepen understanding of weak signals, this article introduces the concept *future sign*, which is based on semiotic theories, especially Peirce's triadic model of the sign. Semiotics is seen applicable for use in future studies, especially with weak sign(al)s, because semiotics is focused on understanding signs. As weak sign(al)s are signs which may foretell future events, the use of semiotics is justified here.

The future sign is designed to function as a general model that can be used to understand the concept weak sign(al) and to estimate its characteristics. The future sign can be divided into three dimensions according to Peirce's sign: *the object*, *the representamen* and *the interpretant*. In the case of future signs, these dimensions have the following meanings:

- *The object* refers to an (emerging) issue.
- *The representamen* is the concrete form the sign takes. I will call this *signal*, because it is usually sent by someone (note: not in every case, though). In the case of future signs, signals can take the form of a news article, a rumour, a photo, a story in TV news, an image, etc. The signal is in connection with the *issue*.
- *The interpretant* is a sense made of the future potentiality of the sign. This means the clarity to an interpreter of the sign to make assumptions of future events based on the sign. Contexts are included in this dimension, because interpreters make their conclusions about the signs in their own context.

The model of the triadic future sign is presented in Fig. 2. In this figure, the case of H&M, discussed in the beginning of the Section 3, is used as an example.

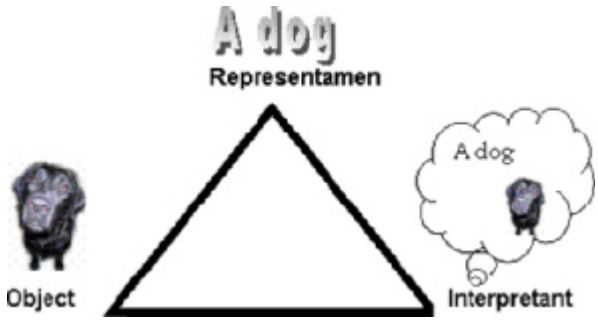

Fig. 1. The "Peircean" sign [70, p. 21, modified].

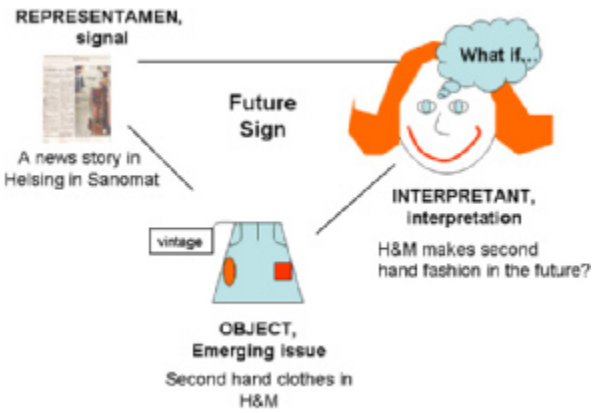

Fig. 2. The model of the future sign adapted from Peirce's triadic model of a sign (case Hennes and Mauritz).

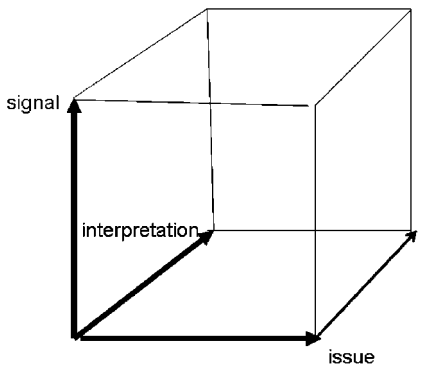

Fig. 3. Three dimensions of the future sign: signal, interpretation and issue.

For further examination of dynamic characteristics of the future sign in particular, I find it worthwhile to describe the future sign in three-dimensional space too (see Fig. 3). In this figure, the axes (i.e. the dimensions of the future sign) are called *the signal*, *the issue* and *the interpretation*. The units of these dimensions are the following:

The signal: the number and/or visibility of signals.

The issue: for example, the number of events. A variety of other units that describe the diffusion of the phenomenon are also possible (e.g. the percentage of net sales or the percentage of internal sales, the amount of employees abroad).

The interpretation: the receiver's understanding of the future sign's meaning (an organizational point of view of this can be the importance of the sign for an organization in the future).

Weak signals are hereafter referred to as *weak signs* or *weak future signs*. The intensity of the sign will be discussed more thoroughly in Sections 4.4 and 4.4.1.

3.2. Semiotic and epistemological discussion about the future sign

Although semiotics, more specifically Peirce's model of the sign, is applied in this article, it must be emphasized that the author's experience is more in the field of future studies. Despite that, I see that it might be possible to use semiotics in other future's fields, like in analysing the images of future. However, using semiotics is not unambiguous, and semiotics has faced some critique. It is considered to be "relatively loosely defined critical practise, rather than a unified, full-fledged analytical method or theory" [56]. It is also criticized

for being "imperialistic" because of trespassing on almost every academic discipline, and for being too abstract and arid. Also, the focusing of semiotic study mainly on synchronic analysis (static) instead of diachronic analysis (dynamic) is held as its disadvantage [58]. Some of the critique also fits to the model of the future sign, which is based on a semiotic theory. To name one, the future sign's abstractiveness is its disadvantage. However, the purpose of the model is in the first place to understand important dimensions of signs from the future's perspective. For that purpose, the future sign serves well.

The model of the future sign is based on realism, which my engineering background supports (see: Walker's [57] writing about realism and physical science). Thus, from the epistemological point of view, the future sign could be connected closely to realism, which is defined in the following way: "In epistemology realism represents the theory that particular things exist independently of our perception. This position is in direct contrast to the theory of idealism, which holds that reality exists only in the mind" [58]. Realistic view is occupied by Platonists in an 'extreme' form [59, p. 408]. Also, Peirce called himself a realist [60, p. 194], although he is related to pragmatism too [61,62]. As a realist, I believe that there is an objective reality (discussed further in Section 4.3). Reality exists even if there was nobody making notes of it. Tarasti [61] connects realistic and idealistic world views to semiotics by talking about exogenic signs that belong to empirical reality, which is observable to anyone, and endogenic signs that belong to subject's inner reality. However, it appears that it is not always easy to make a difference between those two kinds of signs.

On the other hand, in regard to future, interpretating reality is important for anticipating the forthcoming challenges. Besides, in many cases, the receiver may have the opportunity to affect the future. Thus, constructivist view can also been seen applicable to the theory of the future sign. According to Mir and Watson: "constructivism brings to the foreground that strategy researchers are actors rather than mere information processors and reactors" [62]. In the case of the future sign, the term *strategy researchers* in Mir and Watson's quote can be replaced by the term *receiver of the sign*. However, it is important to notice that the receiver of the sign is not always capable of acting on the sign, if the future is, in the words of De Jouvenel [63], dominating.

The third epistemological view that is possible in the case of the future sign is pragmatism. According to Newall, pragmatism in epistemology means "considering something knowledge if it is useful to some end" [64]. Pragmatist view is occupied when the receiver is estimating the importance of the issues for him/her or the organization. As can be seen, a single epistemological view cannot be selected for the future sign. As Patton [65, p. 71] puts it: "Operating narrowly within any singular paradigm can be quite limiting".

4. Answering the critique of weak signal's definition by the model of the future sign

As mentioned above, the obscurity and variety of characteristics of weak signals have raised a debate among researchers in Finland. The problem of defining the characteristics of weak signals was first introduced in the Delphi panel of future researches in Finland coordinated by Kuusi et al. [24]. Two conflicting definitions for weak signals were put forward in the Delphi panel according to preferences of the characteristics of weak signals, which in this study were referred to as "weak future signals". These definitions are called "the most supported weak future signals" formed from the characteristics most preferred by the participants, and "an anti-definition of weak signals" that was formed from the characteristics the least preferred by the participants. The definitions are the following:

The most supported weak future signal:

> A weak future signal is an early warning of change, which typically becomes stronger by combining with other signals. The significance of a weak future signal is determined by the objectives of its recipient, and finding it typically requires systematic searching. A weak future signal requires: (i) support, (ii) critical mass, (iii) growth of its influence space, and dedicated actors, i.e. 'the champions', in order to become a strong future signal, or to prevent itself from becoming a strong negative signal. A weak future signal is usually recognised by pioneers or special groups not by acknowledged experts.

An 'anti-definition' of weak future signal:

> It is crucial for the credibility of a weak future signal that it comes from acknowledged experts, and those experts are also most able to recognise weak signals. A weak future signal is not dependent on an interpreter, i.e.

it is an objective phenomenon. The weak future signal anticipates processes that have radical impacts on future and it typically includes a sign, which needs to be seized immediately. An important weak future signal strengthens by itself over time, since it is an early warning of a general rising trend [24].

Moijanen [26] criticized the lack of consistency in the definition of weak signals, especially referring mainly to the Delphi study by Kuusi et al. [24]. She commented that the only characteristic of a weak signal commonly accepted among researchers is that it is the first sign of a possible change in the future. According to Moijanen, there is confusion about the following points and questions of the term weak signal: its relationship to the transition phenomenon, its duration, its objectivity vs. subjectivity, and who the interpreters of weak signals are. There also remain the questions: who are the receivers, observers and analysers of weak signals and who analyses and draws the conclusions of them. On the basis of (mainly Finnish) literature on weak signals Moijanen examined, she concludes that the researchers have defined weak signals in three ways: In the broadest sense of the term, several simultaneously affecting phenomena and consequences significant for understanding the general objectives of future studies are, in theory, included in the weak signal. Defined more narrowly, the weak signal is in itself a changing phenomenon. In the strictest definition, the weak signal is a sign that preindicates future changes. In Table 1, I have summarized the essential questions Moijanen [26] found problematic for defining the term *weak signal*. I consider these questions relevant for this article.[2]

Pitkänen [49], on the other hand, strongly criticizes the use of the term weak signal in future studies. Discussing weak signals as *signals* is in his view incorrect, as signals require a sender. In the case of weak signals the sender is missing. According to Pitkänen, linking the theory of weak signals to mathematical communication theory developed in the late 1940s by Claude Shannon, Norbert Weiner and Warren Weaver is incorrect. He also criticizes using cosmic radiation as an analogy for weak signals. Unlike radio astronomers who can predict, e.g., planetary movements on the basis of theories and observations of cosmic radiation, futurists have no theoretical laws for predicting the future. Nevertheless, Pitkänen distinguishes two kinds of weak signals: subjective and objective. He sheds a light on the possibility of developing a theory of objective signal, but also, at the same time, denies the very possibility as a paradox. He argues that subjective signals are even more problematic and calls for more detailed theoretical discussions on weak signals [49].

In her analysis of Kuusi et al.'s [24] Delphi panel, Moijanen [26] shows the inconsistencies in the definition of the weak signal. The three-dimensional model of the future sign is developed to answer Moijanen's and Pitkänen's critique. Pitkänen's critique is mainly answered by shifting the discussion from the signals to signs, the theory of which can be utilized in future studies, too. The aim of the following sections is to test the model of the future sign against the critical points in defining weak signals listed by Moijanen in Table 1 [26].

4.1. Weak sign and its relation to transition phenomena

One of the indeterminacies of the characteristics of weak signals according to Moijanen is the relation of weak signals to the transition phenomena [26]. There are the following three views of that: (1) the weak signal is the same as the transition phenomena that will weaken or strengthen in the future, (2) the weak signal itself triggers change, and (3) the weak signal is a sign of change in the future. The triadic model of the future sign clarifies the confrontation of the claims numbers 1 and 3: the model shows that the sign itself includes either the phenomenon or the issue (or the object, as Peirce labels this dimension) and the signal (the representamen, as Peirce marks it). However, the triadic model of the future sign does not take a stand in regard to the effects of the sign, which in this case concern the sign's ability to trigger further changes. Importantly, it does not exclude the possible ability either.

4.2. Duration of weak sign

Moijanen [26] also discusses the signal's duration. The statements on the issue can be divided into two categories: (1) the weak signal only lasts for a moment, or (2) the weak signal lasts longer. The underlying assumption in the two categories is that the weak signal is either the phenomenon or just the sign of change.

[2]The unclear issues (properties of weak signals) are from the titles in the article by Moijanen, except for number 4b, which on the other hand, exists in the text. It is seen to be relevant for this article.

Table 1
Differences in the definition of the term weak signal by Moijanen [26]

	Property of weak signal	Different views
1.	Transition phenomenon	• A weak signal is the same as the transition phenomenon, that is going to get stronger or weaker in the future • A phenomenon interpreted as a weak signal is triggering changes • A weak signal is a sign of changes in the future (a consequence of something that already exists)
2.	Duration of a weak signal	Weak signals lasts only a moment: (1) Weak signals seen as a sign that lasts for a moment, but a phenomenon behind it lasts longer OR (2) Weak signals are phenomena that last for a short time (wild cards?) Weak signal lasts longer: (1) A weak signal is a cause for a change in the future (2) A weak signal is a phenomenon itself
3.	Objectivity/subjectivity of a signal	• Weak signals are independent of their receiver. ''Weak signals float in the phenomena space and wait for someone to find them'' • A weak signal does not exist without a receiver (and the interpretation of the receiver) of it
4.	Different ways to interpret the same signal	• Interpretation adds subjectivity to the signal-even though it is thought to be objective. The interpretation of a same signal can be different from the point of view of the different receivers of the signal
4b.	Strengthening of a weak signal	• The weak signal (as a sign) itself is strengthening • A phenomenon, interpreted as weak signal, is strengthening • A phenomenon whose change is in question, is strengthening
5.	Receivers/observers/ analysts of the signal	• Differences in the opinion in who is the receiver or observer of the signal: experts, special groups etc. • Difficulties in defining the concept expert
6.	Who analyses and draws the conclusions?	• Who is drawing the conclusions on the cause–effect relationship? • Who is defining the credibility and significance of weak signal? • Who is the one that can affect the decisions concerning the future?

In the triadic model of the future sign, the signs consisting of three dimensions entails that its duration is also connected to each dimension. The duration of the weak sign is thus the time from the sign's first appearance to its becoming a strong sign or, alternatively, vanishing. In the future sign cube (Fig. 3) we can measure the time of the sign's turning from weak to strong, or alternatively to vanishing. However, it is problematic to draw a line between a weak and a strong sign in practice.

When examining the three dimensions of the future sign separately, we can notice that the duration of each dimension is different. The duration of a *signal* may only be a moment (a TV news item, a gesture, etc.), whereas another signal might not vanish as quickly, but continue existing, even though less visibly. Good examples of this are newspaper articles: they do not cease to exist once their lifecycle in the newsstand has come to an end, but, to the delight of researchers, survive in archives and libraries. Also, the Internet has changed the filing systems completely. Even the ''old news'' is now easily available for everybody.

The other dimension, *the issue*, and its unit, the event, can last for a short or a long period. When one event stops, another event of the same phenomenon can begin. Many events can exist side by side, too. The duration of the *interpretation* dimension is the most confusing of the three. In my view, the duration in this case is

extremely difficult to determinate. The duration of a weak sign is thus mainly dominated by the objective dimension of the future sign. The objective and subjective dimensions are discussed more thoroughly in the next section.

4.3. Objectivity and subjectivity of sign

The discussion about the objectivity and subjectivity of weak signals has revolved around the question whether or not one signal can appear weak for one person and strong for another. The fact that weak signals are dependent on the context in which they are interpreted seems to support that it can. In practice, this kind of thinking proposes that in one context the signal can be weak and strong in another. The counterargument for this is that weak signals are purely objective (see e.g. Linturi [50]) and, in theory, possible for everybody to notice.

The three-dimensional model of the future sign clarifies the problematics of objectivity and subjectivity of a sign(al). I argue that there is an objective, two-dimensional aspect in the sign consisting of the axes *signal* and *issue*. The objectivity of these dimensions comes from the fact that the number of events and signals are countable and, in theory, visible to everybody. The only subjective dimension in the three-dimensional sign is the *interpretation* of the sign, which can be thought to include the context aspect. Thus interpretation is subjective, related to the receiver and interpreter of the sign (see Fig. 4).

4.4. Intensity and strengthening of the sign

Another challenging issue in the problematics of weak signals has been the strengthening of a sign(al). This issue was touched on in Section 4.2 dealing with the sign's duration. The triadic model of a sign enables one to look at the sign's strengthening as changes in the coordinates in the three-dimensional space. A sign strengthens when there is a rise in at least one of the dimensions (signal, issue and interpretation). The number and visibility of signals mark the axis of the *signal*. To simplify this: if there are only a couple of small news stories about an issue in papers, the value of a signal is graded low. Oppositely, the signal is graded high, when the signal's number/visibility is high. In the case of the *issue* dimension, the number of events is the unit of this axis. This is similar to emerging of issues from a single event to a phenomenon, which have been discussed by Molitor [33]. Emerging issues have also been discussed by, e.g. Reinhardt [66], Schultz [47] and Dator [34,35].

The third dimension, the *interpretation* of the sign is strengthening when it becomes more obvious to the receiver what the sign could mean for the future. The strengthening process of the sign is described in Fig. 5. To summarize the previous in practice: in the purest form of a weak sign, there are only few concrete signals of it and only one or two events, and it is unclear for the receiver what this could mean for the future. On the other hand, with a strong sign, there are many concrete, visible signals, the number of the issues is extensive and the interpretation of the meaning of the sign for the future is clear.

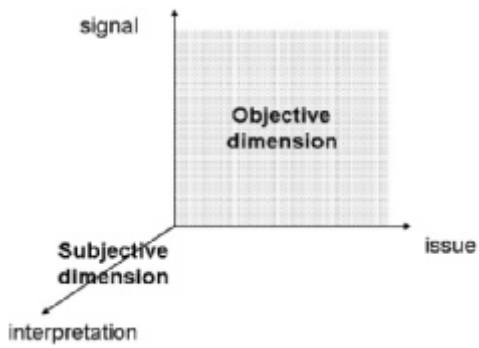

Fig. 4. Objective and subjective dimensions of the future sign.

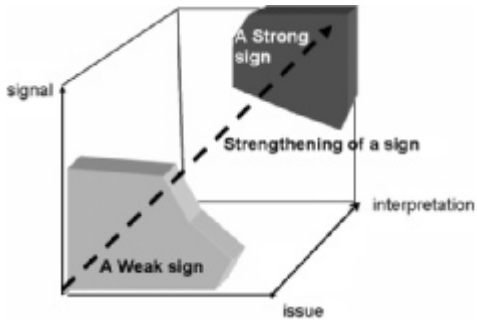

Fig. 5. Strengthening of the future sign. The dashed line arrow shows the direction of the sign's strengthening in three-dimensional space. Areas that represent clear examples of weak and strong signs are marked in the picture, too.

4.4.1. Examples of weak and strong signs

The question remains: was the news story of H&M a weak sign? By using the model presented in this paper we may roughly estimate the intensity of the sign. In this case, the *signal* itself (the article) was quite visible, being in the main newspaper in Finland. From the global point of view, the news appearing in the main newspaper of Finland is of course a minor fact. It is, however, beyond my knowledge how much this issue has been reported in media of other countries. (The problem of the limits of receiver's viewpoints is discussed in the Section 4.5.) The *issue* itself, H&M having second hand clothes for sale in its shops, is positioned low in the issue axis, as it is only 1% of H&M shops that do so. The *interpretation* of this sign from the perspective of future purposes is unclear to me. Does it mean that H&M will have second hand clothes for sale in all of its shops? More generally, will other shop chains start to sell second hand products next to new ones? Is this a start of trend that recycling will be taken even more seriously in consumer businesses? This is unclear to me, so the level of interpretation is low. I have marked a star in the coordinates in the approximate place according to the rates of the axis. It appears that the case of H&M selling vintage clothes could be called a weak sign, since the sign is relatively close to origin of the three-dimensional model of the future sign (see Fig. 6).

The internationalization of Nokia, which was originally a Finnish company, provides an example of a strong sign. Nokia has many factories and offices abroad and over the 50% of the employees are working outside of Finland.[3] Thus, the *issue* level is high. Also, there are many signals of the internationalization tendency of Nokia, for example, in the form of articles in business papers and newspapers. Consequently, the *signal* level is high. For an interpreter, like me, it is clear to make the conclusion that Nokia will continue to be a global company in the future, too (*interpretation* level is graded high). The three-dimensional sign of the internationalizing of Nokia is presented in Fig. 6.

4.5. People dealing with weak signs

In Moijanen's [26] article, there is debate about who the receivers, observers and analysts of the weak signal are. Also, Moijanen presents the question of who draws the conclusions about a weak signal, especially its cause–effect relationship, credibility and significance. Another question is who are the ones that can affect the decisions concerning the future.

With the triadic model of the future sign there is an objective dimension that is, in theory, visible to all. However, because of the surveillance, mentality and power filters mentioned by Ansoff [4] as well as other obstacles discussed by Webb [6, pp. 12–14], all available information is not observed by the receiver (see Fig. 7).

In any case, the more existing objective information is received, the easier it is to make an interpretation of it. There are, in my opinion, particular groups of people who have better chances of getting a clearer view of

[3]Data based on e-mail discussion with Riitta Mård, Communications Manager at Nokia, 19 June 2006.

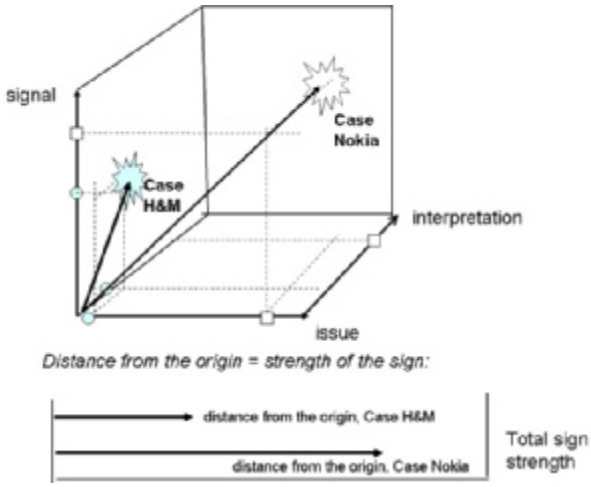

Fig. 6. Strength of the signs: H&M selling second hand clothes and Nokia becoming a global company.

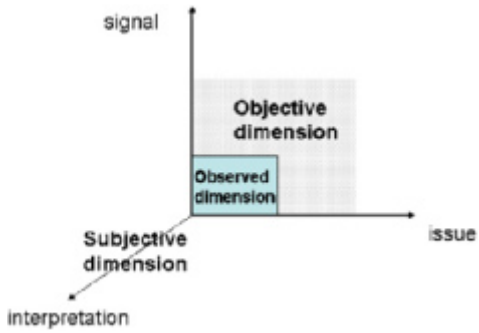

Fig. 7. The objective dimension and the observed part of the objective dimension.

the future signs. Experts within their disciplines have the basic knowledge of what are the newest forms of developments in their fields (i.e. they cover the objective dimension of a sign better). It is not obvious that making an interpretation of a sign is any easier for them, however. Fortunately, the amount of information received from the objective dimension can be widened. This is done by systematically scanning the environment from sources that report on the emerging issues in their early stages. For example, Molitor [33], Choo [67] and Reinhardt [66] list these sources. Day and Schoemaker [14] also talk about the importance of scanning the periphery for weak signals. Thus, people who actively follow the changes in the environment can observe the objective dimension of the future signs better. Respectively, people who are open-minded and future-oriented can interpret the subjective dimension of the sign and its implications for the future more easily.

5. Two types of weak signs

In my previous works I have divided the weak sign (referred to as weak signals in the previous work) into two categories based on the existing literature on the subject. These categories are named (1) *early information* and (2) *first symptoms* [20,22]. In *early information*, the number of signals or the visibility of signals is small. Likewise, the number of events (issues) is small, too. The previous facts make the interpretation of the sign

Fig. 8. Two different kinds of weak signs: first symptoms and early information.

difficult, which, in turn, makes the sign weak. Some examples of this type of weak sign are new innovations or inventions.

The other category is called *first symptoms*. In this case, the signals of the event are numerous as well as visible, but we have trouble interpreting the sign. An example of this might be a change in what we have been accustomed to, like a change in somebody's behaviour. The change itself is recognizable, but for us it is not necessarily clear what it means for the future. The differences of these two types of weak signs are presented in Fig. 8.

As an example of these two different kinds of weak signs I have often presented two news articles that include discussion about famous women and their assumed pregnancy. The story of Princess Stephanie and her suspected pregnancy in a tabloid in 2001 [68] is an example of early information type of the weak sign. In the article, the journalist intimated that her belly has become bigger. The rumours of possible pregnancy began to spread. When considering the dimensions of the future sign, the issue itself, i.e., the growing embryo indicated by the size of a belly was still relatively small and hard to detect. Had the princess been pregnant, the size of her belly would have increased notably, which in this case would have been the *issue*. Furthermore, the level of other two dimensions in the coordinates would be low; there were only some signals about the issue available and the interpretation of the sign was not clear enough at that stage. In the three-dimensional model (Fig. 8), this sign is placed in the area of *early information*.

In another article from 2000, journalists suspected Erja Häkkinen, the wife of the famous Formula 1 driver Mika Häkkinen, of being pregnant [69]. The journalist came to that conclusion because: "…Four weeks ago Erja stopped smoking and drinking, and did not even drink to celebrate Häkkinen's victory in Spain. She was seen in a restaurant on Thursday at the Nürburgring eating a salad. Apparently she generally has a far larger appetite…" In this case, the signals (not drinking and smoking) were there more openly visible to a wider public, i.e. the *signal* level is higher. On the other hand, the *issue* itself (a growing embryo, which a growing belly is indicating), was not seen at all. Also, it was not easy to interpret the signals (not drinking and smoking) with great confidence. Thus this sign is located in the area of *first symptoms* type of weak signs in Fig. 8.

6. The future sign's usefulness and its challenges

I have presented in this paper the triadic model of the future sign to answer better the critique of the diverse definitions of weak signals some researchers have raised [26,49]. I have partly abandoned the term signal because of its problematic nature, and rather replaced it with the term (future) sign. A sign is a central definition in the field of semiotics. From now on, I prefer to name weak signals as weak future signs, the weakness of which can be determined with the three dimensions of the future sign. Of course, because of the abstract nature of the future sign's dimensions, there is no accurate way to measure the strength of a sign. Nor is the model's purpose to give any accurate measures of the sign's strength. Instead, it aims to combine the three key dimensions (signal, issue and interpretation) in the definition of the future sign. Rather than being either a concrete signal or a particular event, the future sign is both of them; furthermore, it adds a dimension of interpretation in it as well.

Although the future sign is aimed to be a theoretical frame for understanding weak sign(al)s, it also has practical value for understanding the changes from the future perspective. In particular, it clarifies the difference between what is really happening (issue) and what its information value (signal) is. In many cases, some emerging issues capture the interest of the media and thus make us easily overvalue the possibilities of emerging issues. A classical example of these kinds of occasions is the overvaluing of company share prices. Media may praise a company even if its real condition was not that good and a closer look at the company's important economic figures could reveal its true condition. Thus, the future sign gives an opportunity to estimate future changes more objectively by combining the three dimensions.

The triadic model of the future sign presented in this paper is not inclusive. This model is indeed a "first draft" in an effort to understand the concepts *future sign* and *weak sign* (before: weak signals) in general. It attempts to erase some of the obscurity of the definition of weak signals, but certainly it will need further elaboration by researchers.

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Osmo Kuusi & Elina Hiltunen

THE SIGNIFICATION PROCESS OF THE FUTURE SIGN

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TABLE OF CONTENTS

ABSTRACT

Weak signals have aroused increasing interest among futurists in recent years. The dilemma caused by their varying definitions led Hiltunen (E. Hiltunen, The Future Sign and Three Dimensions of It, accepted for publication in Futures) to introduce the concept *future sign*, which is based on Peirce's semiotic model of the sign. Hiltunen's conceptual framework is developed further in this paper. The focus of the analysis shifts from single future signs to the *signification processes* in which the future signs are perceived, interpreted and produced. The idea is that every future-oriented signification process is based on some *issue* on the agenda. It is a process of learning and acting, focused on the solving of problems related to the issue in question.

1. INTRODUCTION

Weak signals have aroused increasing interest among futurists in recent years (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], Mendonça et al. [15], van der Heijden [16], Brabandere [17], Lücken [18], Salmon [19], Saul [20], Metsämuuronen [21], Mannermaa [22, 23, 24, 25], Hiltunen [26, 27, 28, 29, 30], Kuusi et al. [31] , Nikander [32], Moijanen [33], Ilmola & Kuusi [34], Uskali [35], Brummer [36], Kuosa [37]). They are considered essential in terms of anticipating future changes, but there is no common understanding about their definition. Authors have used the following synonyms, for example: *seeds of change, emerging issues, strategy signals, early-warning signals and wild cards* (see, for example: Molitor [38], Dator [39, 40], Nikander [32], Mannermaa [22] and Petersen [41]).

The dilemma caused by these varying definitions led Hiltunen [42] to introduce the concept *future sign*, which is based on Peirce's semiotic model of the sign [43]. This triadic model consists of the *representant (also called representamen)*, the *interpretant* and the *object*. The representant stands for the form the sign takes (not necessarily material, but perceivable); the interpretant is equivalent not to the interpreter but rather to the sense made by the sign; and the object is that to which the sign refers [44]. According to Hiltunen, the future sign includes three dimensions: issue, signal and interpretation. These dimensions and their correspondences to Peirce's sign are illustrated in Figure 1. [42]

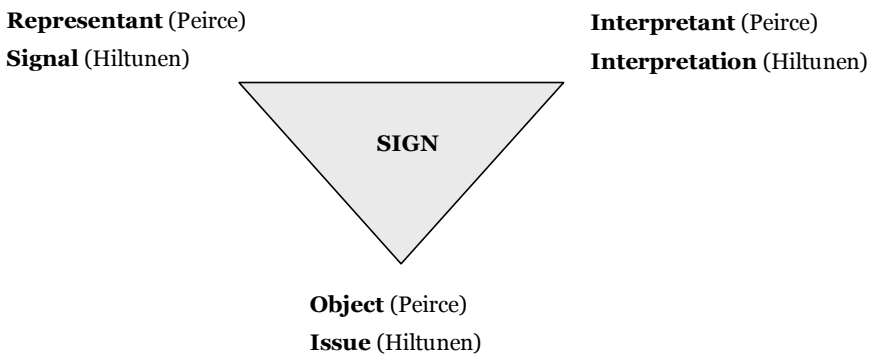

Figure 1. Peirce's triadic model of a sign and Hiltunen's future sign [42]

Peirce focused his attention on single signs. For example, when we see a traffic sign on the street we perceive what Peirce calls the representant. This perceived aspect of a traffic sign would be its physical form, in other words a colorful piece of metal with three angles. We make sense of the sign's meaning (interpretant according to Peirce). Our interpretation connects the traffic sign (representant) with its object (e.g., a dangerous bend in the road).

While Hiltunen uses the analogy of Peirce's triadic sign in the future sign, she goes a little further in her thinking. She has presented a three-dimensional sign (see Figure 2.) to help in describing its development from weak to strong, for example.

The three-dimensional sign also incorporates many signals (representants according to Peirce) and issues (objects according to Peirce).

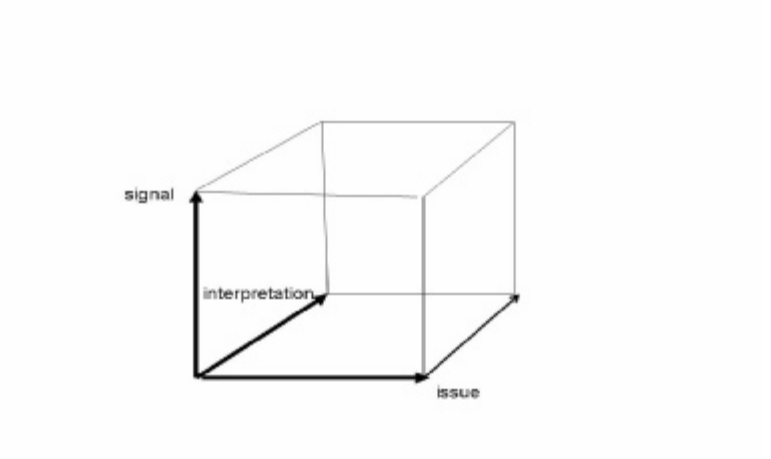

Figure 2. Hiltunen's three-dimensional future sign [42]

The authors examine the dynamics of the future sign i.e. the signification process in this article. The aim in this article is to go more deeply into the future-oriented signification process by drawing on Tarasti's [45] theory of endosigns and exosigns.

2. THE FUTURE-ORIENTED SIGNIFICATION PROCESS

The signification process in this article means the emergence and development of issues and signals/exosigns connected to them, interpreting them (transferring exosigns to endosigns), recreating (secondary) exosigns for communication, and acting based the signs and on the issues. It is a complex process with many interconnections. Figure 3 shows a signification process and the interconnections/interactions in it.

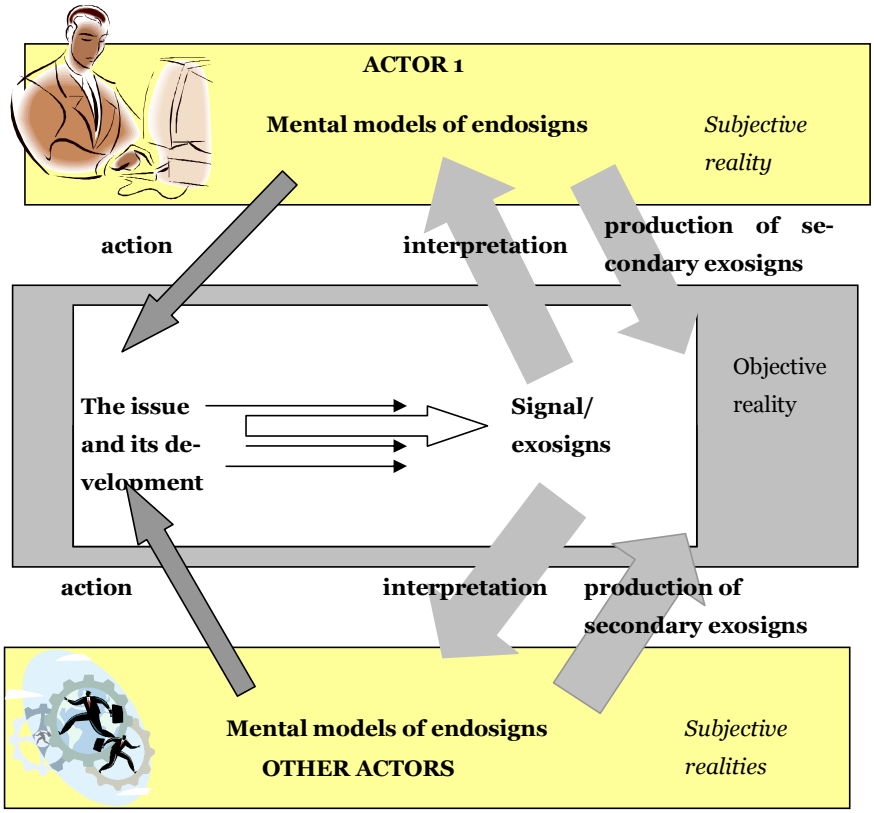

Figure 3. The signification process with its interconnections and interactions

We will discuss the concepts used in the signification model in more detail later. This section gives a short overview of the whole process and presents two illustrative examples.

The signification process starts with the emergence of an issue, which is represented by signals, i.e. (primary) exosigns (from now on in this article we will call signals exosigns). It is also important to no-

tice that the issue itself usually develops temporally and creates further primary exosigns. Exosigns are received by an actor who then interprets them. The actor can notice early exosigns or just late ones. In the interpretation phase exosigns turn into endosigns of the actor's mental model. Depending on the interpretation, an actor makes his/her decision to act on the issue, i.e. tries directly to affect it.

The actor can also send new exosigns (called secondary exosigns) to other actors and thereby try to make them act on the issue. The action is related to the positive or negative value given to the secondary exosign by the sender of it. The interpretation of the receiver depends on his or her skills to decode the message. The receiver may act on the issue and/or send new exosigns and so forth.

Two practical examples of signification processes are presented below.

A METEOR APPROACHING THE EARTH

When a meteor is approaching the earth there is only an exosign, a small spot of light, visible in the sky at first. As it gets nearer it appears as a clearer and bigger light in the sky. Primary exosigns of the meteor do not depend on the mental model of anybody. In this case the amount of informative primary exosigns increases when the meteor comes closer to the earth. How the exosigns are interpreted depends very much on mental models, however. If the mental model of the interpreter ignores the exosigns of the approaching meteor, the perceived relevance of the issue is near zero. The ignoration might, however, be a big mistake if the meteor is on target to hit the earth.

Apart from the primary exosigns emitted from the issue, there are relevant secondary exosigns based on some receivers' mental models. The small spot of light in the sky is perceived by observers. They write articles in newspapers, thereby transforming their endosigns to secondary exosigns that are visible to many. Thus the number of secondary exosigns that are based on endosigns (interpretations of other people) also increases step by step.

The exosigns and endosigns of the issue (the meteor approaching the earth) might result in action that has an impact on its relevance. Some action, e.g., a hydrogen-bomb explosion on the meteor, might resolve the issue and make it irrelevant.

A DANGEROUS BEND IN THE ROAD

A bend in the road is potentially a place where traffic accidents occur or dangerous situations arise. People construct a mental model connecting the accident with the issue, i.e. the dangerous bend. This process results in a secondary exosign: the traffic sign that warns about the bend. Drivers are able to anticipate the issue based on that secondary exosign, and it becomes less relevant (less dangerous) because of it.

3. KEY CONCEPTS OF THE FUTURE-ORIENTED SIGNIFICATION PROCESS

The following sections cover the key concepts related to the signification process. The concepts and sections related to them are presented in Table 1.

Table 1. The key concepts of the future-oriented signification process and concepts related to it.

KEY CONCEPTS	TYPES OF CONCEPT	RELATED CONCEPTS
Actor (section 3.1)	Person Community Humankind Other learning beings	Interpreter Influencer Stakeholder Senses Learning capacity Memory Mental model
Issue (section 3.3)	Natural/ Social Masterable/Dominating/Strongly dominating Urgent/ Not urgent	Relevance (perceived and true) Life cycle Agenda Achievement level Interest variable Adaptation
Exosign (i.e. signal) (section 3.2)	Primary Secondary	Production Hype Censorship Manipulation Dissemination Theory formation
Interpretation (section 3.4)		Interpreter Senses Learning capacity Mental model Code (decoding)
Endosign (section 3.2, section 3.4)		Memory Storage capacity of the memory Mental model

3.1 Actors in the signification process

We will use the definition of an actor given by Kuusi [46]. In order to be an actor a being has to be able at least at some stage of his/her/its life

- to learn based on his/her/its senses
- to store the results of his/her/its learning in the memory and
- to influence the development of issues based on his/her/its interests.

Actors (e.g., a single human being, a small community, humankind) are in key positions in the signification process. 1 They may be involved in such a process in three ways, which are not mutually exclusive: as an interpreter, an influencer and/or a stakeholder. The interpreter constructs endosigns concerning the issue in his/her mind. The endosigns in the memory function as a system that we call the actor's mental model. The influencer tries and is able to have an effect on the development of the issue, and the issue can have a positive or negative impact on the stakeholder.

Primary exosigns do not depend on the perception and interpretation of any actor, and without an interpretation of them there is no signification process. However, an actor might have an impact on an issue or on its primary exosign without an interpretation. For example, someone might step on an exceptionally rare plant without perceiving it.

As an influencer, an actor might act directly on an issue or she/he might transmit related secondary exosigns to other actors. An influencer might also destroy exosigns if he/she does not like the fact that other actors will perceive the issue.

An actor may also be a passive stakeholder of an issue without giving any personal interpretation of it. Being a stakeholder means that the developing issue is going to affect him or her.

[1] An actor is not necessarily a human being or a community of human beings: it could also be an intelligent machine or an intelligent animal. In order to simplify the discussion, however, the examples given are either single human beings or communities of human beings.

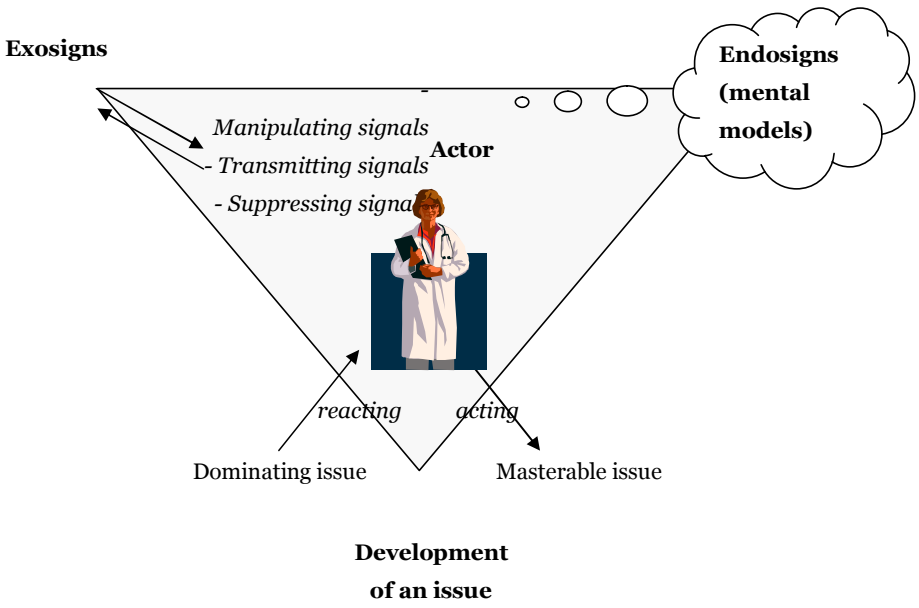

Figure 4. An actor in the signification process.

3.2. Exosigns and endosigns

Tarasti's [45] distinction between endogenic and exogenic, between the inner and outer aspects of sign processes, reorganizes the knowledge offered by classical semiotics.

A hundred years ago Jacob von Uexküll, an Estonian biologist and physician, made a distinction between "Umwelt" and "Umgebung". Umwelt refers to the subjective phenomenal world of an organism, the world of the "self", while Umgebung refers to the organism's actual physical environment. According to Uexküll: "Exosemiotic sign processes transform the objective environment into subjective universes or individual realities. They require endosemiotic processes which build up the... 'counter worlds' or 'inner worlds' in the animal or human body" .

Exogenic signs belong to empirical reality, and are observable by anyone. The following question is paramount here: By what rules of inference can we make correct reasoning, on the basis of external facts, about what is internal? The extreme behaviorists hold that everything is in outer behavior and should be read therein. According to the Stimulus-Response (S-R) model of behavior an external stimulus (S) is followed by an external response (R). The problem is that the same external stimulus would produce very different kinds of external responses based on different internal processes.

Modern cognitive psychology has rejected the research program of the behaviorists. The most reasonable explanatory model now is the connectionism model. Connectionism means the statistics-based adjustment of 'weights' and the excitation or inhibition of neurons. When a group of linked neurons fires it triggers a memory (e.g., Edelman and Tonini [47]). It is reasonable to think – as Edelman and Tonini do – that a person needs about 0.1 – 0.2 seconds to reach a conscious conclusion, which is based on a highly integrated network of billions of nerve cells ("the dynamic core hypothesis"). The dynamic core is the physical counterpart of the mental model. What should be the capacity and the level of integration of the dynamic core of an actor is an open question. Seth et al. [48] have suggested some promising measures for their evaluation.

Tarasti [45 p. 43-45] gives many examples of behavior that does not make sense without a complex dynamic core. Without belief, prayer is an empty gesture; without real content, artistic virtuosity fails to move us; a statesman's acts are legitimate only when supported by the right ideas.

In addition to primary exosigns there are secondary exosigns, which have already gone through a signification process once or more often (i.e. turned into endosigns). In practice, secondary exosigns include newspaper articles or a newsflash about the issue. In some cases their number may too high in the light of the true relevance of the issue. A case in point would be when the media take up some emerging issue as its favorite and write about it excessively compared to its relevance. This could be called *hype*. In the opposite case the emerging issue might be very relevant but most of the exosigns are suppressed. This is called *censorship*.

3.3 The issue and related concepts in the signification process

The third main aspect of the signification process is the issue. Tarasti [45] does not discuss this, and focuses only on the interaction between exosigns and endosigns on the general level.

The on-line dictionary MSN Encarta [49] gives several definitions of the word issue. In the context of this article there are two that are the most suitable: an issue is a *"subject of concern: something for discussion or of general concern"*, or the *"main subject: the central or most important topic in a discussion or debate"*. Its most important feature is its *potential relevance to the receiver*. If the event/object does not have potential relevance to an actor (receiver) then it does not qualify as an issue. A meteor in space is not an issue for an average person, but "a meteor approaching the earth (and it might destroy my town)" is an issue that has potential relevance to an average interpreter. Here it is important to separate two possible ways of seeing the relevance of the issue. Perceived relevance is how relevant the interpreter thinks the issue is, while true relevance is its absolute and objective relevance to the stakeholders.

It is important to understand the lifecycle of an issue, i.e. how an event/series of events rises to the agenda and drops off it. An event/ series of events turns into an issue when it becomes relevant to someone. On the other hand, when it is "resolved" or loses its significance it drops off the agenda.

In this context it is necessary to introduce the concept of the *achievement level* related to an issue: An issue drops off the agenda or is no longer urgent when the achievement level has been reached. It could be seen as the necessary element of any action and futures-related learning process, as Kuusi [49,50] suggested in his General Theory of Consistency. The achievement level can be measured in terms of *interest variable(s),* which are related to the measuring of the issue. For example, the interest variables for "the rise of the water level" are centimeters, while for the issue of global warming they are degrees Celsius or Fahrenheit.

Furthermore, an issue might drop off the agenda following unsuccessful attempts to reach the achievement level: such attempts result in a lower achievement level. One often has to accept the present situation, or even something worse later. This means that the actor *adapts to* the new level. The adaptation may also go in the other direction: one has achieved something and wants more.

There are some human activities in which the role of the achievement level and adaptation are especially evident and important. Success in sport depends very much on reaching the proper achievement level: not too low or too high. The ranking among all relevant players is the clear interest variable. High levels of cognitive engagement and task persistence in the face of difficulty depend on the proper achievement level and adaptation to it.

Below is an example of the achievement level and of the interest variable of a community issue:

> *The water level of the river starts to rise and there is a threat that water will flood the houses in the town (an issue comes onto the agenda). The achievement level here is that the water will not flood the houses. The interest variable is the level of the water (e.g., in centimeters). When the proper value in the interest variable is achieved, the issue drops off the agenda. The adaptation can happen in the building of a dam to protect the town, for example*

3.3.1. Different types of issues

The key aspect of an issue *concerns to whom it is relevant, i.e. who are its stakeholders*. An issue may be relevant only to one actor (a non-infectious disease) or to the population at large (an epidemic). Related to this is the role of the *influencer* who is able to have an impact on the issue. For some issues only one person can make a difference, while for others it needs a wider population in order for it to be dropped off the agenda.

The nature of issues leads to three further classifications. The first of these is related *to the social aspect of the issue*, which Molitor [38] discusses in terms of the division of reality or of being. Other issues could be classified as *natural issues*. These include events in nature such as a rise in the water level, the warming of the climate, and meteor activity. The laws of nature, or the manipulation of natural objects based on these laws, are the driving forces here. Other issues happen in the social environment and thus

could be called *social issues*. They are based on the interpretations of people. For example, capital punishment as an issue in the USA is based mostly on what people think (their values), although its execution is based on the laws of nature. People determine how social issues develop.

The second categorization is discussed in the classical work of Bernard de Jouvenel [51]. For a given actor the future is divided into *dominating* and *masterable* parts. The actor can manipulate a masterable future or issue but not a dominating future or issue. De Jouvenel stresses an important point: "In human affairs the future is often dominating as far as I am concerned, but is masterable by a more powerful actor, an actor from a different level": the example he gave was environmental pollution in Paris. An issue may also be *strongly dominating* (he did not mention this) if no human being or group of human beings is able to have a relevant impact on its realization or development. It follows from this definition that no social issue is strongly dominating.

The urgency of the issue indicates how much reaction time there is (see Ansoff [4, p. 367] and Nikander [32]). All of the previously mentioned qualities - to whom the issue is relevant, the actor and the urgency - are related to time. For example, as time passes a masterable issue can turn into a dominating or strongly dominating one if nothing is done within a certain time. Similarly, an issue that concerns only one or a few persons may start to affect many if nothing is done with it. Table 2 gives examples of issues and various ways of categorizing them. It can thus be seen that the possibility of affecting any one issue (such as capital punishment) varies depending on the actor.

Table 2. Ways of categorizing an issue.

	The nature of the issue		**Actor impact**			**Actor**			**Stakeholder**			**Urgency**		
Issue	natural	social	masterable	dominating	strongly dominating	person	community	humankind	person	community	humankind	no	medium	urgent
the rise of the water level in a river	x		x				x		x	x			x	x
climate change brought about by the greenhouse effect	x			x		x	x		x	x	x		x	
climate change brought about by the greenhouse effect	x		x					x	x	x	x		x	
capital punishment		x	x				x		x	x			x	
capital punishment		x		x		x			x					x

3.4 The interpretation process and the related dissemination of exosigns

Interpretation is an activity in which endosigns are formulated in the mind of the actor based on the exosigns of the issue. A possible next step is to produce further (secondary) exosigns for other actors in order to obtain their feedback or try to make them act on the issue. This *dissemination* of exosigns is highly important for the managing of the issue, especially if it is dominating.

Figure 5 illustrates the dissemination of exosigns and their turning into endosigns in the signification process.

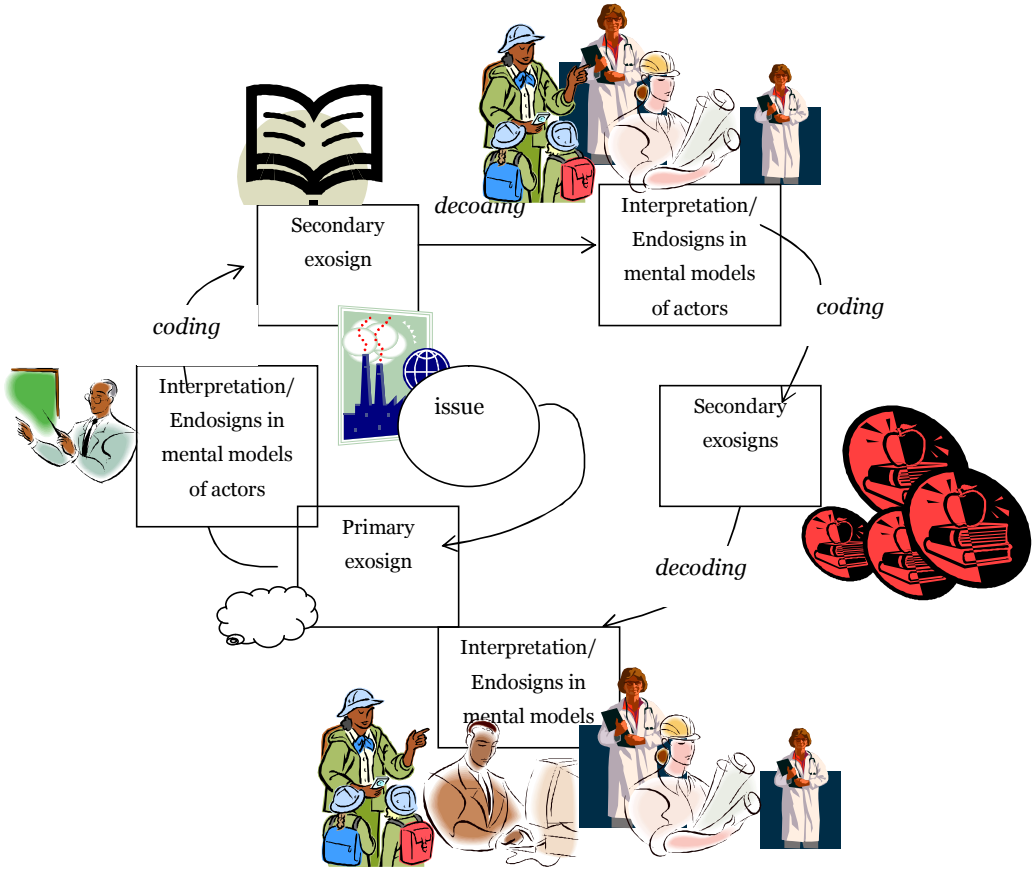

Figure 5. An example of the dissemination of exosigns in the signification process.

The future-oriented signification process is mainly started by the issue, of which the primary exosign is a visible form. The activating exosign typically starts this process. Even if exosigns are visible to us, the underlying issue might be totally new. *Theory formulation* is needed if we are to understand the issue correctly: the theory facilitates understanding of the cause –consequence relationships between the issue

and the related exosigns. When we understand the theory we may understand other exosigns appearing because of the issue, and anticipate the appearance of more exosigns. A practical example of theory formulation is the interpretation of the greenhouse effect. Exosigns such as the rise in temperatures and the rising sea levels are the visible signals. Further examination has revealed the same issue, the greenhouse effect, behind both of them [52]. Now that we know the theory we can expect new exosigns to appear because of the greenhouse effect.

There are three alternatives for observing and connecting the issue and its related exosigns. In the first case both are invisible to observers. It is thus impossible to make any realistic assumptions about the issue because there are no exosigns. However, wild guesses are, of course, available: we might assume that there is alien life in the universe though we are not able to prove it.

In the second case, exosigns of the issue are visible but the issue itself is invisible. From the exosigns it is possible to start to formulate a theory about the relationship between the issue and the signals, which in this case may be symptoms of the issue. For example, if you hear a knocking noise when you are driving a car it is an exosign of something out of the ordinary. The driver may start to think about what is causing the noise. Later it might come out that his wife had left another set of car keys in the other door lock and they are rattling against the surface of the door. (This is not impossible: it really happened to the second author of this article.)

In the third case it is possible to test the connection between the issue and its exosigns: it is possible, for example, to show that greenhouse gases in the atmosphere result in higher temperatures. Figure 6. illustrates the different ways of observing the issue and exosigns in the light of the theory formulation.

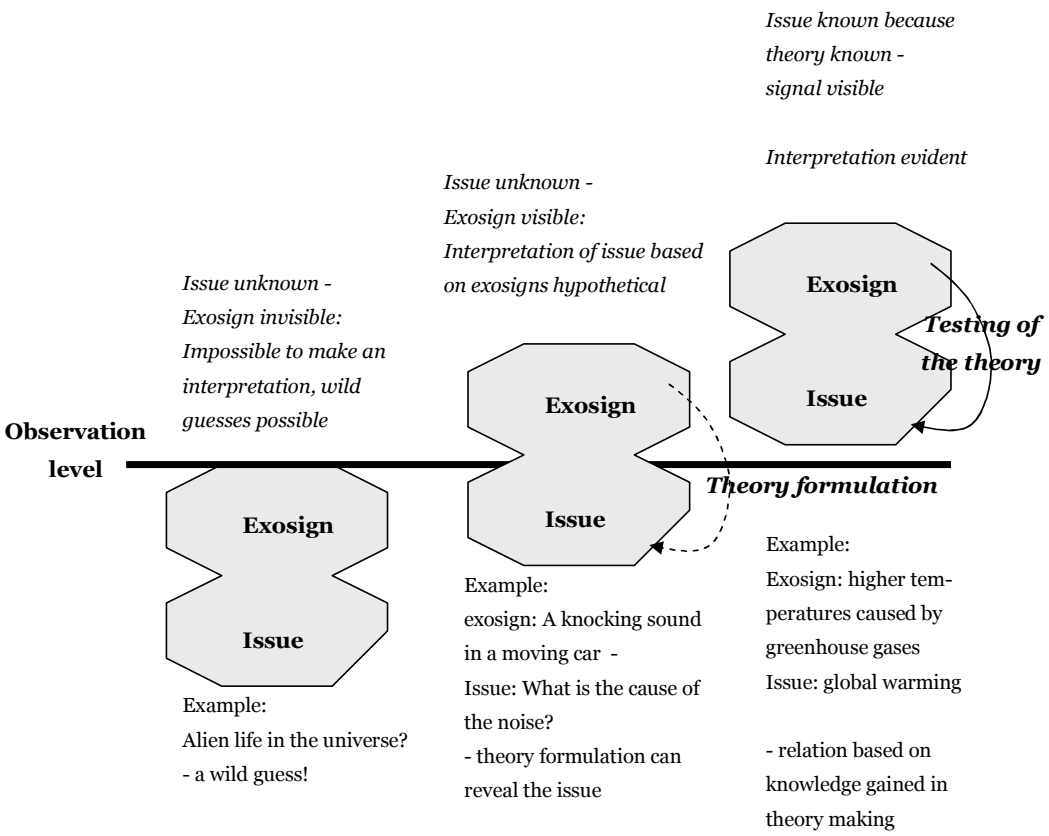

Figure 6. Signals/Exosigns and issues (the objective dimension), and ways of observing them

Sometimes the actor purposefully misunderstands the signal (primary exosign or secondary exosigns) and deliberately transmits a misleading secondary exosign. In practice, a wrong signal (exosign) could be a piece of news in a magazine that is deliberately misinterpreting the truth about the issue. In the case of natural phenomena this might lead to delayed response, and in case of social issues wrong signals may even change them.

4. THE SIGNIFICATION PROCESS AND THE THEORY OF SEMIOTICS

It seems that the above interpretation of the signification process gives an answer to one of the most debated questions in the field of semiotics: the integration of the two main lines of semiotic theory. The first line is based on the Peircian signal-interpretant-object triangle, and the second is the dual interpretation of the sign suggested by the famous semiotician Bernhard de Saussure: the signified and the signifier.

Our suggestion is that the de Saussurian interpretation works better on the level of *single and static* signs and the Peircian interpretation (in an applied form) is better on the level of the *dynamic signification process*, explaining the development of an issue, for example.

It is reasonable to assume that the *exosign has two main aspects* suggested by de Saussure: *the signified* or the perceived "real" aspect, and *the signifier* or the content aspect linking it to the endosigns used in its interpretation. The "real" aspect implies that anyone with suitable means of perception is able to perceive it (with proper senses and instruments, such as telescopes). For example, the real aspect of a traffic sign is a colorful metal plate with three angles or light waves reflected from its surface. The content aspect is related to the shared or not-shared endosigns of people.

The common and shared interpretation of an exosign requires not only that people share single endosigns but also that they have common mental models. The spoken or written language is the most important common mental model shared by people belonging to the same language community. In fact, this mental model is only partly shared. De Saussure called the shared part "Lang" (i.e. the Language) and the not-shared part "Parole" (i.e. the Speaking). For the shared interpretation of a traffic sign people need a further common mental model: a common code for the interpretation of traffic signs. The development of mental models is no longer a black box. They are based on cerebral processes and are better and better understood in the light of recent advances in the biosciences.

5. DISCUSSION

The purpose of this article was to provide a consistent conceptual framework for the analysis of future-oriented signs. With this in mind we suggest an important modification to Charles Peirce's classic interpretation of the sign: the object of the future-oriented sign is an issue (see Hiltunen [42]). The relevant issue is the starting point of the signification process, which ends when the issue drops off the agenda.

Our conceptual framework is suitable both for the anticipation of future developments based on recent signals and for the explanation of past developments. As in our model, the first stage in a political process is the agenda setting. Kingdom [53] defines a governmental agenda as a list of subjects or problems to which government officials and those close to them are paying serious attention. Thus, an agenda-setting process narrows the list of conceivable subjects within any given domain (e.g., health policy). Agendas often change dramatically. Issues "hit" suddenly if the signals are strong enough.

Kingdom's examples taken from the history of the USA are the New Deal, the Great Society and the Reagan revolution. There are exosigns that anticipate that "the policy window" of an issue will open. For example, the first unsuccessful attack by Al Gaida against the World Trade Center in 1993 was a clear early warning, which was not a strong enough signal to get the terrorism issue on the political agenda of the USA, however. A second very strong exosign was needed to push it onto the agenda and to start the future-oriented signification process.

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THE SIGNIFICATION PROCESS OF THE FUTURE SIGN

Weak signals have aroused increasing interest among futurists in recent years. The dilemma caused by their varying definitions led Hiltunen (E. Hiltunen, The Future Sign and Three Dimensions of It, accepted for publication in Futures) to introduce the concept *future sign*, which is based on Peirce's semiotic model of the sign. Hiltunen's conceptual framework is developed further in this paper. The focus of the analysis shifts from single future signs to the *signification processes* in which the future signs are perceived, interpreted and produced. The idea is that every future-oriented signification process is based on some *issue* on the agenda. It is a process of learning and acting, focused on the solving of problems related to the issue in question.

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Good Sources of Weak Signals: A Global Study of Where Futurists Look For Weak Signals[1]

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Abstract

Weak signals are valuable tools when anticipating the future changes. They mean today's information that can foretell the changes in the future. This article focuses on the good sources of weak signals. For this an international study was made where futurists were asked to list sources that they appreciate in finding weak signals. It appeared that futurist generally consider futurist, scientist and colleagues to be good sources for future oriented information. For spotting weak signals openness and dialogue is recommended.

Keywords: weak signals, future, futurist, sources of weak signals

Introduction

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

This article focuses on the sources for weak signals in anticipating future changes. The article summarizes a global study about sources of weak signals that was done at spring 2007. 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 their natural tendency to scan for weak signals of change in their work. Also, these people are considered by the researcher to be pioneers in looking at futures. An invitation to participate the research was sent to as many futurists and future-oriented people as possible by various channels like email lists and links in Internet pages. Responses were received from one hundred and twenty one futurists.

The results of this study show that ranking of good sources for weak signals varied according to the area of life. The top five good sources of weak signals (all areas of life included in order of superiority) in the 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.

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 change, creativity, receptiveness, intuition and a curious mind is needed to find weak signals of change.

Anticipating Changes by Using Weak Signals and Scanning the Environment

In anticipating future changes there are two key concepts that are related to this article: 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, 1975, 1980, 1982, 1984, 1985; Webb 1987, Coffman, 1997 a-e, Blanco & Lesca 1997, Harris & Zeisler 2002, Day & Schoemaker 2005, Mannermaa 1999a, 1999b, 2000, Hiltunen 2000a, 2000b, 2001, 2005a, 2005b, 2006, 2007a, 2007b, Kuusi et al. 2000, Kuusi & Hiltunen 2007, Nikander 2002, Moijanen 2003, Ilmola & Kuusi 2006 , Uskali 2005, Brummer 2005, Kuosa 2005). Sometimes weak signals and emerging issues are considered as synonyms, but Hiltunen (2007b) has made a distinction between them by presenting the concept of *future sign*, in which weak signals are understood more as signals 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 the future.

For anticipating changes it is important to look for emerging issues and weak signals of them from all around of us. This activity is called environmental scanning. Aguilar (1967, p.1) defined environmental scanning as "an activity for acquiring information". He (1967, p. 18) continued 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 (1999) stated that environmental scanning analyzes information about every sector of the external environment that can help management to plan the organization's future. Cook (1986) commented that "environmental scanning is the practice of searching a wide array of information sources on a

regular basis for symptoms of change." Neufeld (1995, p. 39), on the other hand, emphasized 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."

The Dynamics of Change and Appearing of Issues

For finding out where to scan weak signals for anticipating the future it is important to understand the logic of change. Ferguson (1993) commented that few changes in the environment occur spontaneously: they start as ideas. These ideas eventually obtain public expression in the press, radio, television, university conferences, and scientific journals. Dator (2005, p. 205) described 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 (2005, p. 205) continued 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 whether their growth should be encouraged, discouraged, or ignored."

According to Dill (1962, in Choo, 2006, p. 112) "from information perspective, every change or development in the external environment creates signals and messages that organizations may need to heed." Choo (2006, pp. 112-113) continued 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 (2003) has presented his forecasting model where he discusses patterns of change. This model has been studied carefully for example by Harris (1994). Molitor's earlier ideas about anticipating changes from 1970's have been represented and refined by Wygant and Markely (1988). Based on that, Choo (n.d.) has modified an information life cycle of emerging issues, which is seen in the Figure 1.

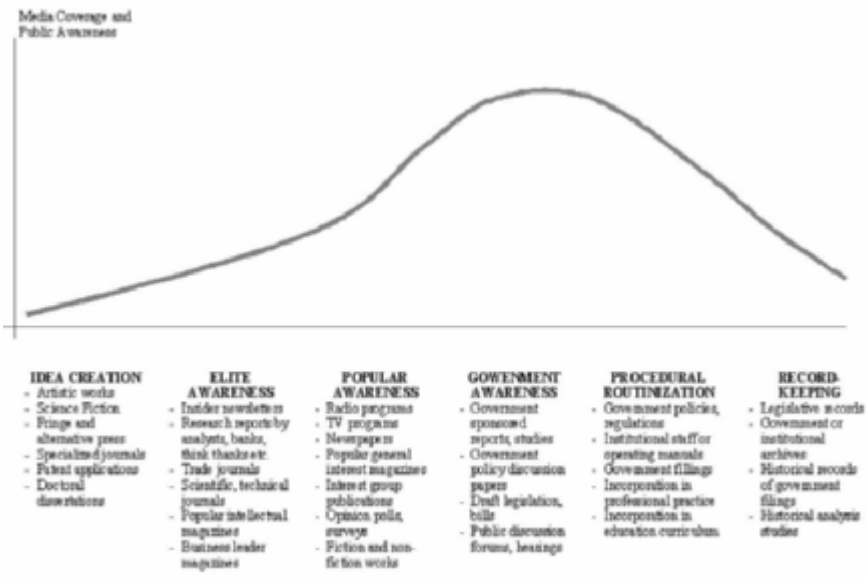

Figure 1. Information life-cycle of emerging issues by Choo (n.d.) adapted from Wygant and Markley (1988).[2]

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 Markely (1988) *idea creation* and *elite awareness* phases. In these stages the idea appears in public for the first time. Thus, sources like artistic works, science fiction, fringe and alternative press etc. are identified as this stage as good for finding weak signals of emerging issues. An important update for these results is mentioned by Day and Shoemaker (2006), who underlined the periphery as a source of weak signals for the future. They (2006, pp. 56-59) emphasized 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 (1967, p.66), Neufeld (1985, p.48), Webb (1987, p.107) and Keegan (1974). In the empirical part of this paper, however, Choo's (1995, 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* (on-line databases and cd-roms and Internet).

It can be assumed that the importance of online sources has increased in recent years, and this have changed the "patterns of change" and sources of emerging issues identified by Molitor (2003), Wygant and Markely (1988) and Choo (n.d.). However, many of the documents that have been available previously only in paper form are now also available electronically via Internet. In that way Internet is only offering an extra channel for spreading information.

Characteristics of Sources Used For Environmental Scanning

According to literature, there are some elements and types of sources that are more appreciated in anticipating changes than other. Aguilar (1967, 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 (1967, p. 68-69) drew conclusions that scanning processes for important external information appears to rely heavily on the manager's personal network of communications. Similar conclusions about the importance of managers' personal network was also found out by Heikell (1986) who has analyzed a few books and some 40 articles of sources on scanning activities. Choo's (1994), Sawy's (1985) and Keegan's (1974) results are also pointing to this direction. Choo (1999) has specified that information from human sources may be preferred when dealing with ambiguous, unstructured problem situations.

Other characteristics too affect to the use of a source in environmental scanning. O'Reilly (1982) has found that the quality and accessibility of a source affect its use in scanning. Saunders and Jones (1990, pp. 32-33) summarized 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 for this empirical component of this research. 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.

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 anticipate 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.

This study aimed to find answers to questions that arise from going through previous studies in this area. In addition, the experience of author's in this field has raised some questions that this study seeks to answer. The research questions were the following:

RQ1: What are the sources futurists or future-oriented people consider good for finding weak signals?

RQ2: What sources are considered good in different areas of life?

RQ3: What categories of sources are preferred in finding weak signals?

This study of weak signals was accomplished during spring 2007 by 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 lists and links in Internet pages). 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[3]. 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 of the respondents did not answer every question. This is why the number of respondents is shown with the results.

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 number 2 and 3 focused on listing the sources of weak signals. In those pages, the respondents were asked to mark the area of life which they follow the most (referred as priority 1 in this study) and the second most (referred 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. The sources to the questionnaire were collected from various research (e.g. Webb, 1987, Choo, n.d.), and some sources were added by the researcher. For the analysis purposes the sources were divided, as stated above, according to categorization of Choo (1995, p.139). In the last page, the respondents were allowed to write freely about good sources of weak signals. They also had the chance 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 first piloted among Finland Futures Research Center people and slightly changed for the international study based on the feedback and user experiences.

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 that answered to 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%) also participated in the study.

Experience and interests in the futures field was measured in the questionnaire in several ways. Half of the respondents (50.8%, N=118) 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 future studies (16.1%) and the third were professors in areas other than future 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.

The experience of the respondents in looking at futures was considered to be a key question to evaluate 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 futures field. The majority of the respondents (45.8%, N=118) had over 15 years of experience in looking at futures. 16.9% had 11-15 years of experience and the same percent of respondents were valid for 6-10 years of experience. While 15.3% had experience of 2-5 years and 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 maximum 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.

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 the researcher had 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.

In this study the respondents 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 among the respondents, changes in learning and education the fifth, and changes in politics the sixth. The respondents followed changes in fashion the least. Only two people marked that they follow this area of life. Because of the lack of respondents in this area, it was excluded from the analysis.

Results of the Study and Answers to the Research Questions

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 article it is more convenient to examine first the good sources for weak signals for looking changes at different areas of life.

In the study, the respondents were asked to mark the areas of life out of seven alternative areas of life (political changes, economic and business changes, changes in society and culture, changes is technology and science, environmental changes, changes in learning, and education and changes in fashion) of which changes the respondent is the most interested in (referred to as priority 1) and follows the most. The respondent were asked to mark *good* sources for weak signals in those areas out of a list of 36 sources (one of them being "other source", see the list of sources and categorization of sources from Appendix 2). The respondents were also asked to mark, which area of life they follow the second most (referred 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 a 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 from the analysis.

To see more detailed results, the sources of weak signals are divided according to the area of life to which they were connected by the respondents. Summarized results (the top preferred sources) are shown in Tables 1-6.

Table 1. *Good sources for weak signals for changes in politics (N=12).*

sources for politics	priority 1	priority 2	altogether
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

Note: Priority 1 refers to number of respondents that have selected to follow the most political changes, priority 2 refers to number of respondents looking for political changes the second most.

Table 2. *Good sources for 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

Table 3. *Good sources for 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

Table 4. *Good sources for 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

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

sources for environment	priority 1	priority 2	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

Table 6. *Good sources for 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

It is possible to see from the Tables 1-6 that the sources that were considered good for finding weak signals somewhat varied by the area of life of which changes were looked for. At the same time these tables give the answer to RQ 2: "What sources are considered good in different areas of life?"

Mostly, the top sources for weak signals were the same, but their order varied a little. However, there was an area of life, politics, for 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 raked high in the area of politics, while they were not considered to be the top for finding weak signals in other areas. The raking of the top sources for good weak signals 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 for 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 areas of life in question. However, it is possible to rank the sources by combining the rankings of the sources in all areas of life. This way it is possible to answer the RQ 1: "What are the sources that futurists or futures oriented people consider good for finding weak signals?"

Table 7 shows the order of superiority of the sources for weak signals calculated in this way.

Table 7. *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
30	annual reports of companies
31	family/friends
32	patents
33	doctoral dissertations
34	proposals for laws
35	other source?
36	art exhibitions

From Table 7, 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 networks are important for finding information. 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. From 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 (2006, pp. 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 there results to the "information life cycle" by Choo (n.d.) in Figure 1, it is interesting to see that 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 the 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 of these sources, except for academic and scientific journals, the respondents did not much assess them as good sources for weak signals. On the other hand, sources mentioned in the "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.

Use of human, textual and online sources for finding weak signals different area of life

Choo's (1995, p. 139) division of sources into human, textual and online sources is used here to compare where good sources for 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. By this way the RQ 3: "What categories of sources are preferred in finding weak signals?" is answered. Results are presented in the Figure 2.

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 the 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 were 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 to see the limitations of this analysis: the overlapping of the sources (like in human sources: futurists and colleagues are sometimes the same) change the results from what is seen from the Figure 2. That is why the results should be only taken as suggestive.

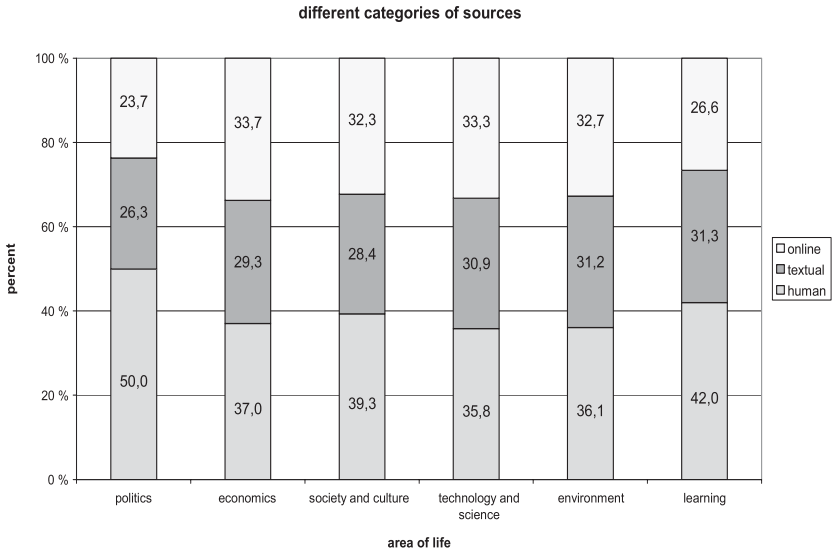

Figure 2. Good sources of weak signals by categories in different areas of life.

Characteristics of good sources for weak signals

Even though the questionnaire was mainly quantitative, the respondent had also the opportunity to write comments about weak signals freely. 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 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 processing of them. Cross-mapping signals was mentioned as one tool for understanding changes. On a personal level sense-making processes for weak signals is 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.

Limitation 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 answer as many questions as possible and to get as much results as possible from the questionnaire. In this research there appeared amazing opportunities to gather information from futurists and future oriented people globally – thanks to many friendly people who helped to spread the invitation to participate in 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 the questionnaire too long and "mechanistic". However, there were opposite views, too: someone commented that the questionnaire was short and to the point.

Even though the questionnaire was tested in the 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, which were another source in the list. This overlapping of the sources can affect the results of the analysis. Overlapping however, was unavoidable, but I think 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 then? There are four reasons for that. Firstly, a previous study of mine had raised an interest in finding out sources that futurist 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 a 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.

Conclusions and Discussion

This study aimed to answer to some question concerning about sources of weak signals. 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 as good for different areas of life. It appeared that there are some differences in sources that are considered good for different areas of life. Some sources were considered in the 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 other 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, and reports of research institutes. The most surprising finding of this study was that various sources of the Internet were not highly appreciated among the respondents. In the times of fast global communication the fact that Internet sources were not appreciated by futurists was a mystery. Is it so that futurists still rely too much on the written reports instead on being confident on finding valuable data in the Internet?

Research question three focused on finding answer to whether some categories of sources are more appreciated in finding weak signals than others. It appeared that all the source categories (human, textual and online) were appreciated almost equally by the respondents. Human sources were, however, most appreciated in all of the categories.

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 changes in the world. As one of the respondents commented, scanning the scanners is a good way to find weak signals. People that are making the future, such as scientists, artists, lead users and fringe, are good sources to keep track of, as well as sources that document their actions like popular science journals and the marginal press. I personally recommend scanning the Internet, especially blogs, even though these were not highly appreciated in this study. Blogs provide a way to see what people are really doing and thinking. The future, as we know, is very much dependent on the 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.

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Notes

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2. The source of the figure is http://choo.fis.utoronto.ca/ncb/es/ESinfoLC.html
3. In the question 5. in the questionnaire experience in futures field was asked ("Your experience in "looking at the futures"). Possibilities for answer varied from none to over 15 years. Respondents that answered none were dropped out from the study.

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Appendix A
Forewords of the questionnaire (including definition of weak signals) and structure of the questionnaire

Forewords in the study:

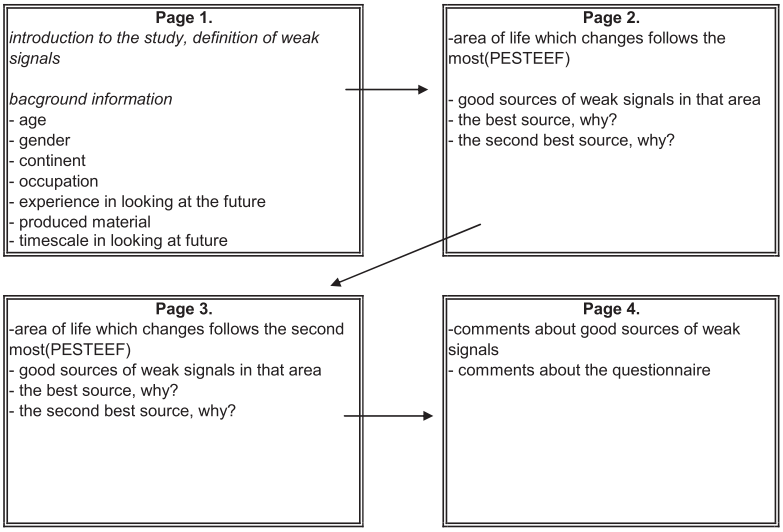
Study about sources of information on future

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/idea/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 B
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 other area 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: companies' or organizations' web pages
- Internet: homepages of individual people/consultants
- Internet: electric databases
- Internet: electric journals
- Internet: blogs
- Internet: discussion groups
- email newsletters

Elina Hiltunen

THE FUTURES WINDOW – A MEDIUM FOR PRESENTING VISUAL WEAK SIGNALS TO TRIGGER EMPLOYEES' FUTURES THINKING IN ORGANIZATIONS

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Abstract

Images are a powerful tool for transferring information and getting people's attention. However, they have not been utilized much in the field of futures studies. This paper introduces a new method, *the Futures Window*, which uses visual weak signals to trigger futures thinking and innovating in organizations. The method was tested as an adapted version at VTT in two pilots and opinions on the method were asked from the employees. The results show that the method was positively received by the employees and it was considered to trigger futures thinking. The results of this study encourage for further development of the Futures Window.

Key words: *visual weak signals, image, futures thinking, futures studies, anticipation, innovating, futures reporter, the Futures Window*

1. Introduction

Weak signals are today's earliest form of information which can foretell changes in the future. This information might sound funny or strange and it can cause confusion, because it offers a totally new idea, innovation or way of thinking. 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 are happening.

In the discipline of futures studies, weak signals are recognized as an important medium for trying to anticipate changes in the future (see for example: Ansoff [1], Coffman [2], Shoemacher and Day [3], Mannermaa [4], Hiltunen [5], Saul [6]). There are several methods for collecting and analyzing weak signals, presented by various researchers (see for example Ansoff [7], Lücken [8], Hiltunen [9], Mannermaa [10], Ilmola [11], Kuosa [12]). However, there seems to be some challenges in utilizing them, because their number is huge and finding patterns of change is challenging. Also, one problem is how to spread the information about weak signals in the organization effectively. The new concept called

the Futures Window, presented in this article, aims to offer a solution to the challenge of spreading weak signals in an organization in visual form.

In the field of futures studies, visual images (photographs, cartoons, drawn images and the like, excluding however normal graphs like pie charts, tables, etc.) have not been utilized much as a technique for anticipating or creating the future.[*] For example a typical way to present scenarios is in a written form (for example: IPPC Special Report: Emission Scenarios [13], Venäjä:2017: kolme skenaariota [Russia: 2017, three scenarios] [14]). One reason for this can be the fact that written form of reporting is more appreciated by academics and officials. Also, the fact that typical futurists' or scenario planners' skills are not sufficient for creating images of the future can be a major reason for the lack of using images. Artists or designers would be needed for this. There are, on the other hand, some companies that have pioneered in using images in communicating future possibilities. One example of this is Philips and its *Vision of the Future* project in 1995. In that project, the designers created images of possible future products and these images were published in the Internet [15] and as a book [16]. Today, Philips Design is still a pioneer in using visualization in communicating future visions.

The power of images is recognized in the old saying: a picture is worth a thousand words. Pictures are also significant in getting people's attention. This is verified in a study by Knobloch et al. [17], who noticed that adding images to articles in an Internet magazine increased the selection of those articles. Furthermore, threatening images increased attention more than innocuous images. Also, an image is more rapidly understood than a text. Biederman [18: pp. 41-42] has found that "in a 100-millisecond exposure of a novel scene, people can usually interpret its meaning…and recognize a pattern in a single glance." Näsänen [19] on the other hand comments that : "In comparison to verbal information, graphic information, icons and other graphic symbols and representations, may greatly facilitate and speed up the processing of visual information in the sense of sight and the brain. For instance, a mouse cursor icon depicting a hand with the index finger

[*] Science Fiction movies, cartoons and images are one outstanding way to present future visions in visual forms. However, this form of art is not utilized much by public organizations or companies

pointing out can be perceived by focusing the eyes just once. The equivalent information in the text form "press this button" would require the eye movement to stop at least twice and would therefore at least double the interpretation time."

The Futures Window method was developed to utilize the power of images, e.g. visual weak signals, in triggering the employees' futures thinking. The author sees that weak signals are excellent tools for enhancing creativity, which is needed in creating the future and futures thinking (anticipation). The Futures Window was piloted at VTT Technical Research Centre of Finland, which is the biggest contract research organisation in Northern Europe. The results of the pilot were promising and that encourages for further development of the Futures Window.

2. Description of the method of the Futures Window

The concept of the Futures Window was developed by the author and VTT volunteered to test the idea in its premises. Originally, the idea of the Futures Window includes monitors that show visual weak signals in the premises of organizations. Visual weak signals can be, for example, images, photographs, animations or video clips of new inventions or strange things happening today[†]. The Futures Window monitors are installed in canteens, coffee rooms, elevators, lobbies, toilets, or wherever a company's employees happen to stand still for a while. See the following figure:

[†] Note: weak signals are not equivalent to scenarios. However, one application of the Futures Window could be to show scenarios of the future.

Figure 1. An imaginary Futures Window in a canteen of some company.

The purpose of the Futures Window is to trigger the employees to think of the possibilities in the future. It might also give new ideas for innovations for people working with product or market development, strategy department, etc.

The Future Window concept originally includes *a futures reporter*, whose task is to produce and collect the material (e.g. images of weak signals) for the Futures Window. A company's futures reporter is a kind of a cool hunter, but with a longer time perspective in her mind. She hunts for visual weak signals by surfing the Internet, wandering around in interesting places with a camera, interviewing the company people and interesting people outside the organization. She also transfers the weak signals, which are in the form of e.g. a text or a rumour, into visual images with the help of artists and designers. She holds the

wires of the Futures Window in her hands and edits all material applicable to the Window (for example material send by the company's employees). The tasks of the futures reporter are portrayed in Figure 2.

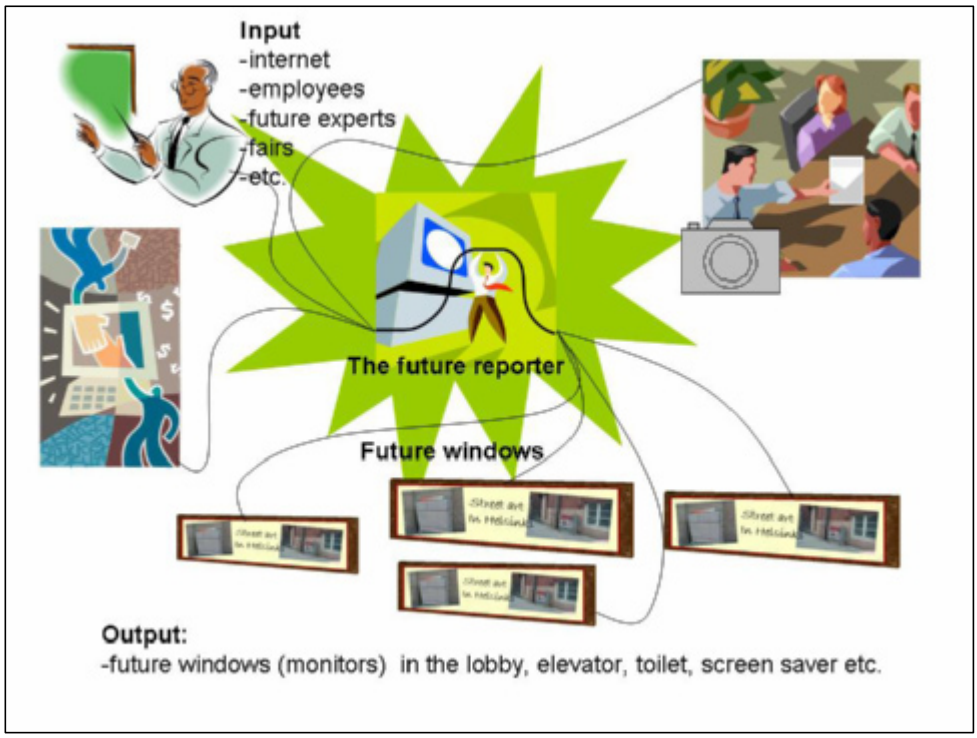

Figure 2. Futures reporter's tasks in the original idea of the Futures Window

3. Pilot Testing of the Futures Window at VTT

The Futures Window has been piloted as an adapted version at VTT Technical Research Centre of Finland. The piloting was done in co-operation with VTT's new future-oriented program Technology Futures Forum (TFF), headed by VTT's Chief Research Scientist *Sirkka Heinonen*. The first pilot (Pilot 1) took place in two seminars arranged at VTT in November 17th (referred to as the first, Somed seminar) and December 1st 2006 (referred to as the second, TFF seminar) and it was combined with group exercises based on the

material in the Futures Window. On the basis of the images, the participants started to think of, for example, services/products that might have a demand in the future. For this process, the participants were given a form which included the basic steps of the exercise.

The second, different type of pilot (Pilot 2) of the Futures Window was arranged in the VTT building DigiHouse during week 9, 2007. This pilot was following the initial idea of the Futures Window more closely. Pilot 2 used the same material as Pilot 1 (see table 1 for details of the pilots). The material, which consisted of 48 images, was collected by the author (44 images) and VTT's Chief Research Scientist *Sirkka Heinonen* (4 images). All the images were shown for 10 seconds at the time, which makes the show about 8 minutes long.

Table 1. Descriptions of Pilots 1 and 2.

	Dates	**Occasions**	**Key idea**	**Material**
Pilot 1	Somed seminar:17th November and TFF seminar 1st December, 2006	Two seminars	The Futures Window material as a starting point of exercises	Power point show of 48 visual weak signals (10 second for each images at the time)
Pilot 2	From 26th February till 2nd March, 2007	A continuous image show for one week in DigiHouse's lobby	Trigger futures thinking of by passers	Same as in the Pilot 1

3.1. Material for the Futures Window

The criterion for selecting the images was that they showed some new idea, invention (social, marketing and technical) or something different from what we are used to see today – i.e., the images could be called *visual weak signals*. Examples of the images were Ecopod coffin made of recycled paper (criteria: a new product concept/thinking in a very traditional

business), Lamborghini for sale in a supermarket next to lemonade bottles (even though being a marketing trick, a new idea of selling even high luxury stuff in every day market existed here), an eye jewellery that was implanted in the eyeball (a totally new concept of implanting extra stuff to eyes), MetroNaps sleeping chair for working environments (present a new idea in the working culture), an ad for "internet free day" (an antitrend for dominating tendency of using internet). Some of the figures also included some text, such as the source of the image and key words of the image. For example in an image of Down's syndrome children modelling the latest spring fashion in a magazine there was the text: "Child Models in the *Perhe* magazine." (In this case, the image also contains text from the magazine article, as for instance the title "Kids Fashion Show" in Finnish.) The image is shown in Figure 3 .

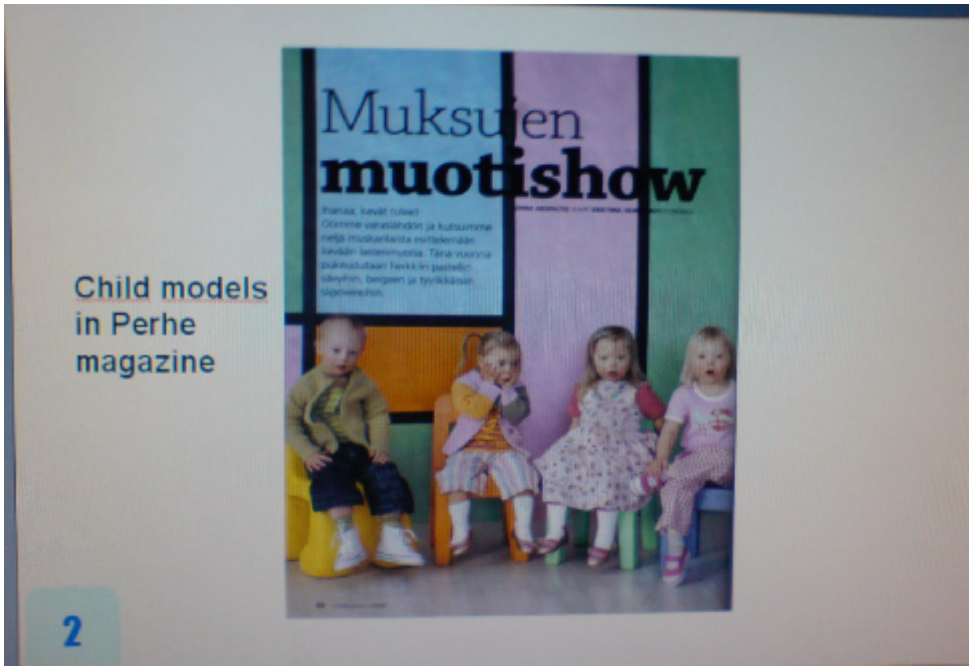

Image 3. An image in the Futures Window: Child models in the *Perhe* magazine

This image was selected as one visual weak signal because it is unusual to use disabled people as fashion models.

3.2. Carrying out the pilots

In Pilot 1 (the two seminars), visual weak signals were presented to the audiences as a power point slide show on big screens during seminar breaks. Also, for a group work based on the visual weak signals, the images were printed as posters that were attached to the walls to make easier the participants' discussion about all the images.

The seminar participants were also asked to fill in a questionnaire about the Futures Window. In the seminars, the questionnaire was available online in computers which were there for that purpose. The participants were encouraged to fill in the questionnaire. The questionnaire consisted of questions related to the respondents' background (gender, age, business at VTT) and opinions about the Futures Window measured in different ways. Also, the respondents had the opportunity to write their comments about the Futures Window method.

In Pilot 2 the same show of visual weak signals was projected on the "glass box" in the lobby of the so-called DigiHouse of VTT. Because of the nature of the "glass box", the images could also be seen from the other side as a mirror images. This was seen as an extra attractor for employees to come to see the Futures Window. Also, a short advertisement of the Futures Window was put on VTT's Intranet, so people working in other VTT buildings were encouraged to come and see the pilot. This pilot took place during 26th February to 2nd March, 2007. The show was switched on by the lobby personnel of the DigiHouse every morning at approximately 7.00-8.00 a.m and it was switched off at about 17.00 p.m.. The next week a questionnaire, which slightly differed from the Pilot 1's questionnaire, was send to all the employees working in the DigiHouse. In addition, people not working at DigiHouse had the opportunity to answer the study via a link put on the Intranet of VTT.

3.3 Results of Pilot 1.

In this section, the results of seminars one and two are put together because of the similarity of the situations. In Pilot 1 (in Somed seminar and TFF seminars), 30 participants (Somed: 13; TFF: 17) from the total of 74 participants answered to the questionnaire, resulting in a

response rate of 40,5%, which can be considered good. 40,0% of the respondents were women and 60,0% men. The majority (40,0%) of the respondents belonged to the age range 26-35 years while the next biggest age group (23,3%) were people 36-45 years. In the seminars, 2/3 were from VTT and 1/3 were outside of VTT.

3.3.1 Opinions about the Futures Window

The participants were asked to comment on some claims about the Futures Window in the questionnaire. It was possible to estimate the claims in four possible degrees (fully disagree, somewhat disagree, somewhat agree and fully agree). Also it was possible to tick "cannot say" if none of the descriptions the values were suitable.

The claims of the study were the following:

1. Futures Window gave me new ideas about the future.
2. The Futures Window could be a useful activator of futures thinking in my own work.
3. In my opinion, it is important to to think in a futures oriented way in my work.
4. At VTT (or other organization, if I am outside of VTT), there could be Futures Windows for example in canteens and coffee rooms.
5. It should be possible for all employees to send images to the Futures Window.
6. The Futures Window gave me new ideas about the possibilities of the technology area that I am working with in the future.

The statistics of the respondents' answers to the claims are shown in Figure 4.

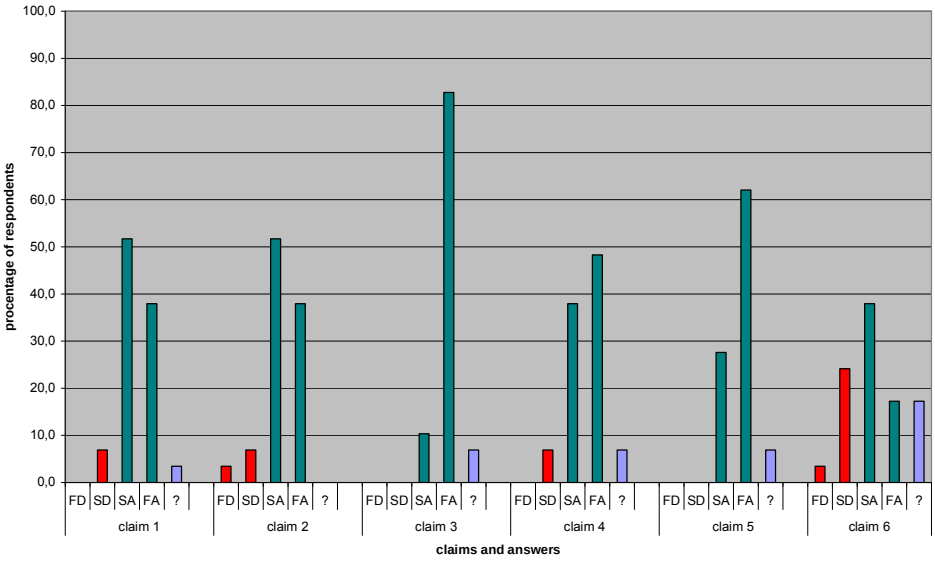

Figure 4. Pilot 1, claims and answers to them.

In the figure 4, the y-axis marks the percentage of respondents. In the x-axis, there are all the claims (1–6) and different possibilities to answer them, which are marked by the following codes: FD= fully disagree, SD= somewhat disagree, SA= somewhat agree, FA= fully agree and ?= cannot say. The overlook of the figure reveals that the attitude to the claims has been very positive. Agreeing with the claims was more preferred than disagreeing. Especially in the claim 3 ("In my opinion, it is important to think in a futures oriented way in my work"), there were no disagreements as an answer, which tells that the participants were future oriented. This could also explain the positive feedback to the Futures Window.

89,7% of the respondents agreed (fully + somewhat) and only 6,9% disagreed (somewhat) with the fist claim ("Futures Window gave me new ideas about the future"). Based on that result, the Futures Window is a valuable tool for triggering futures thinking. The second claim ("The Futures Window could be useful activator of futures thinking in my own work") had similar results than the first. The percentage of

(somewhat + fully) agreeing respondents was again 89,7%, and 10,3% of the respondents disagreed.

The third claim ("In my opinion, it is important to think in a futures oriented way in my work") inquired the importance of futures thinking in the work of the respondents. The percentage of the (somewhat + fully) agreeing was as high as 93,1%. No one disagreed with this claim. The reason for this high numbers is the fact that the pilot was conducted in a research organization which is supposed to look to the future. In addition, the projects (Somed and TFF) are very future oriented, so the participants are also interested in the future.

The purpose of the fourth and fifth claims was to inquire whether there is further need for using the Futures Window at VTT (or other organizations). And if this happened, how should employees be involved with the Window? Thus the fourth claim was: "At VTT (or other organization, if I am outside of VTT), there could be Futures Windows for example in canteens and coffee rooms." 86,2% of the respondents agreed (fully + somewhat) with that claim and 6,9 % disagreed (somewhat). The fifth claim stated: "It should be possible for all employees to send images to the Futures Window." 89,7% of the respondents agreed and no one disagreed. Obviously, the Futures Windows concept could have a demand for further use in organizations. In this case, the employees of the organization should be involved in the process by giving them a chance to participate in creating the content to the Windows.

The sixth claim ("The Futures Window gave me new ideas about the possibilities of the technology area that I am working with in the future") divided opinions the most. 27,6 % of the respondents disagreed (fully + somewhat) and 55,2% agreed (somewhat and fully). Using employees in content providing for the Futures Window might be a solution for getting more ideas from the technology perspective. In this pilot, the material was mainly produced by a person (the author) who does not have that deep knowledge in futures technologies.

The positive attitude to the Futures Window was also seen in the end of the questionnaire where the respondents had the opportunity to write freely comments about the Futures Window. The comments were mainly positive, such as “really good idea,” “OK,” “an interesting method,” and “funny and inspiring.” In addition to writing opinions of the Futures Window, the respondents also started to think of the possibilities to use the Window and further applications.

3.3.2 Reactions to the images

The respondents were also asked to mark which images stuck in their mind best. As a memory aid, the respondents had posters of all the images next to the computer. It appears that the images that stuck in their mind were the most “radical” ones. Also, images that had something “cute” in them raised the interest of people. Examples of radical images in the Window were: eye jewellery (5 notices), the operation to put magnetic implants into fingertips (4 notices), a lady with a corset piercing (5 notices), a mouse with a human ear growing from its back (5 notices). Cute pictures that captured attention were Nabaztag Internet Rabbit (4 notices) and Lifestyle cats (4 notices). Other pictures got less than 3 notices and some of them did not get any.

The respondents were also asked to tick, why some image got their attention. They had approximately eight alternatives from which to choose the one which best describes why the image stuck in their mind. The table 2. summarizes the times each reason was mentioned in the study.

Table 2. Reasons why images stuck into the respondents' mind

Reason	Number of times mentioned by respondents
It irritated me	7
It was a new thing to me	10
It amazed me	5
It made me laugh	8
It raised my interest	16
It raised positive feelings	24
It raised negative feelings	18
Some other reason	11

It is possible to see from the table that the images which raised positive feelings (24 mentions) stuck in the respondents' minds best. Similarly, the images that raised negative feelings (18 mentions) also stuck in people's mind. There should be at least something in the image that is raising the interest (16 mentions) of the viewer. It is interesting to notice that the newness of the issue (10 notions) as such was not enough to make an image stick in people's minds.

3.4. Results of the Pilot 2

Pilot 2 of the Futures Window was accomplished in DigiHouse at VTT in one working week (5 days) between 26th February and 2nd March, 2007. The Future Window slide show was projected to a big glass box type of screen in a lobby of DigiHouse at least nine hours a day (8.00–17.00). See image 5.

Image 5. The Futures Window in DigiHouse at VTT. In the figure, there is an image of the starting page of the show.

The slide show of visual weak signals was the same as in Pilot 1. The questionnaire was send as a link via email to the people working in the DigiHouse the next week. About 280 people received the email. This questionnaire slightly differed from the questionnaire of Pilot 1. For example, the first question in this case was: *Did you see the Futures Window at DigiHouse lobby in week 9*? If the answer to was yes, more questions were provided to the respondent. If the answer was no, the respondent was only asked to leave his/her email address in case further information was needed.

The respondents who saw the Futures Window were asked to answer questions such as did she/he stop to see the images, how long did she/he watch the images, what images she/he remembers, his/her opinions about the Futures Window, and some background information.

All in all 39 people answered the questions. 64,1% of them reported having seen the Futures Window. 64,0% of those who saw the Futures Window stopped to watch the show. Reasons for passing the show by were enquired from the 36,0% (altogether 9 people) who did not stop to see the show at all. 33,3% of them said they were in hurry, 11,1% (one person) commented that she/he was not interested in it and 55,6% (5 people) commented that they had some other reason for not stopping, such as not knowing what the show was about, thinking that it is not anything important and thinking that the place for the show was inappropriate. One respondent pointed out that the area was not suitable for standing around for "nothing", since it would give the customers a wrong impression of VTT's employees.

Half (50,0%) of the 16 people who stopped to see the Futures Window stayed only for a moment and saw 1–5 images, while 31,3% stayed and watched the entire show.

In the questionnaire, people were given the opportunity to comment on the images that they remembered, without further hints about the images. On the basis of the written comments on the images, the image that stuck in people's mind most was an image of a lady with a corset piercing (4/5 respondents; note that here the group of respondents is limited to the 5 respondents who saw the whole Futures Window show). Also, a tattooed girl with horn type of implants in her head drew the respondents' attention (3/5 respondents). Individual respondents remembered other images, too. It was possible to see from the descriptions of the images that the way some of the images were understood differed from the genuine purpose of the image. This was by no means a negative thing, however, as the researcher wished that to happen, because misunderstanding the images is triggering new ways of thinking and breaking mental models.

In the next question, the respondents were helped to remember the images by giving their names and numbers. Also, a link to the Futures Window show was given in the questionnaire, which made it possible for the respondents to have a look at the images again. Here, the respondents were asked which images they remember seeing in the

Futures Window and why did they remember them. An image of new beetle art car was remembered best (9 respondents out of 15), the eye jewellery and Nabaztag were remembered the second best (7/15), and the third most popular image to remain in the respondents' minds was the lady with the corset piercing (6/15). However the results should not be taken as absolute, because not all respondents followed the whole show. The respondents added the following adjectives to the "why" question ("Why these images stuck in your mind?"): weird, interesting, new, good idea, irritating, ironic, unusual, illustrative, and familiar.

In this pilot, the claims of the Futures Window were presented to the respondents as in Pilot 1. However, this time some claims were added and one erased because of its complexity which made it difficult to understand. The claims of Pilot 2 are listed below (italicized claims are similar to claims in Pilot 1).

1. *Futures Window gave me new ideas about the future.*
2. *The Futures Window could be useful activator of futures thinking in my own work.*
3. *In my opinion, it is important to think in a futures oriented way in my work.*
4. *At VTT (or other organization, if I am outside of VTT) there could be Futures Windows for example in canteens and coffee rooms.*
5. *It should be possible for all employees to send images to the Futures Window.*
6. The Futures Window could be taken advantage of also in project works, for example in seminars or brain storming sessions.
7. The Futures Window adds the creativity and innovativeness of the working environment
8. The Futures Window could be shown again with new images in the lobby of DigiHouse for example once a year
9. I have told about the Futures Window or discussed about it with my colleagues or friends.

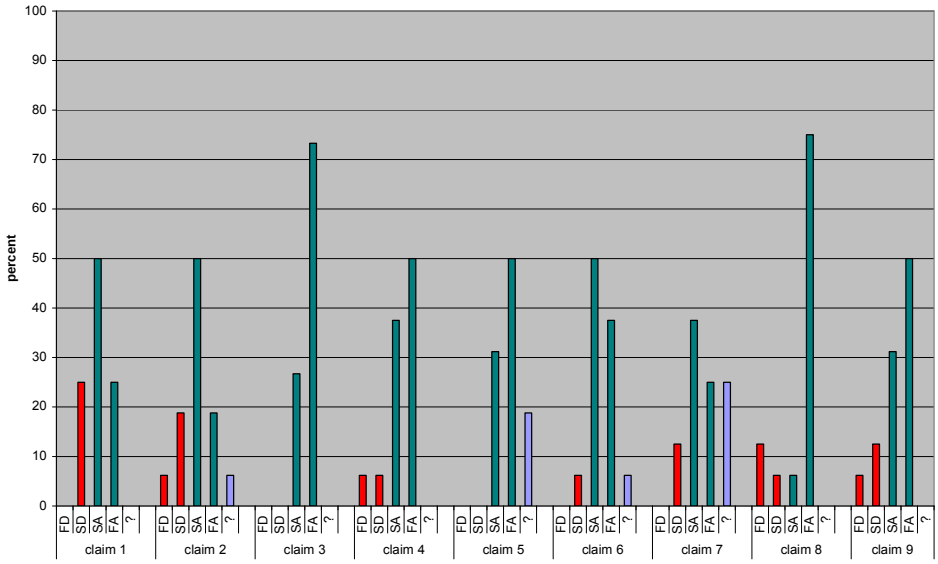

Figure 6. Pilot 2, claims and answers to them.

The results from the claims are shown in Figure 6. In the figure, the y-axis marks the percentage of respondents. In the x-axis, there are all the claims (1–9) and different possibilities to answer them, marked by following codes: FD= fully disagree, SD= somewhat disagree, SA= somewhat agree, FA= fully agree, and ? = cannot say. The results of these claims in Pilot 2 resemble the results of Pilot 1. Again, the feeling about the Futures Window was positive. Claim 1 ("The Futures Window gave me new ideas according to the future") was agreed (somewhat + fully) by 75,0% of the respondents. Claim 2 ("The Futures Window could be useful activator of futures thinking in my own work") was agreed also by a majority of 68,8%. All respondents thought their work requires futures thinking (claim 3). The Futures Window's applicability to organizational environment was considered good by the respondents, of whom 87,5% agreed with claim 4 ("At VTT [or other organization, if I am outside of VTT] there could be Futures Windows for example in canteens and coffee rooms"). Majority of the respondents (81,2%) agreed with claim 5, which stated that the employees should also have a possibility to send their images to the Futures Window.

Claims 6–9 were not presented in Pilot 1 and for Pilot 2 they were added by the request VTT's representative. Claim 6 estimated what the respondents thought of the idea of using the Futures Window for other purposes, for instance, as an assisting method for project work, such as seminars or brainstorming. The majority of the respondents (87,5%) agreed with the claim. When asking opinions about whether the Futures Window enhances creativity and innovativeness, 62,5% agreed, 25,0% did not know and 12,5% disagreed. Also, the degree of interest towards the Futures Window was asked in claim 8, in the form of whether the Futures Window could be displayed with new images in DigiHouse for example once a year. 81,2% agreed with the claim. Claim 9 enquired whether the respondents had talked about the Futures Window to other people. It appeared that 81,2% agreed that they had discussed the Futures Window with their colleague and/or friends.

It was also possible to add comments and suggestions for developing the Futures Window in the questionnaire. Some of the comments concerned the place where the Futures Window was located, which in Pilot 2 appeared not to be optimal for the purpose. A more peaceful place was wished for in order to enable one to have a better look at the Futures Window. The lobby in Pilot 2 was not considered to be a good place, because people usually just pass it by quickly. Some respondents criticized the quality of the images, too. They were considered to bee too blurry, visually not so appealing (too Power Point-like) and the meaning of the images did not come clear to one respondent because there was too little information in it. However, the Futures Window also received positive feedback. It was considered a good idea and more of these types of pilots were asked for. Applying the same technique to other internal communication of VTT was suggested also. One respondent suggested having the same images on the VTT Intranet.

4. Discussion

The Futures Window, a new concept in which visual weak signals are shown to the employees in an organization to trigger their futures thinking, was tested at VTT in two

pilots during the end of the year 2006 and the beginning of the year 2007. The feedback received from the survey asking people's opinions about the Futures Window was generally very positive in both of the pilots, as revealed by the statistics of the answers and the respondents' written comments. The majority of the respondents thought that the Futures Window triggered futures thinking. The majority the respondents also agreed with the idea that there could be Futures Windows in cafeterias or canteens at VTT. The majority of the respondents also wanted the employees to be able to participate in creating the contents of the Window by sending images to the Futures Window.

The images which triggered people's attention were clearly the ones that had something shocking or radical in them. Especially, the images with manipulations of the human being were of interest. Also, something that could be considered as cute (Nabaztag, a cat) were also remembered better than other images. In summary, the images that invoked feelings (positive or negative) were the ones that received attention.

Pilot 2 revealed that the environment in which the Futures Window is displayed is essential, as it turned out that the lobby was not appreciated. A more convenient milieu for experimenting this kind of method would be one where it would be possible to stand still or sit watching and discussing the images with other people. A cafeteria or a canteen might work better for the Futures Window, because there the situation (lunch or a coffee break) would provide a good setting for unhurried discussion.

On the basis of the results of the experiments of the Futures Window at VTT, the method seems to be recommendable to other organizations too for triggering futures thinking. If one is not willing to use it in public spaces, it is also possible to use it elsewhere. For example, it might be a useful device for enhancing futures-oriented thinking in seminars or brainstorming. In whichever way the Window is used, it is important to involve the employees in the method by giving them a chance to send images to it.

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