LEONIE – Learning in Europe: Observatory on National and International Evolution

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REPORT OF WEAK SIGNALS SURVEY ON NATIONAL AND INTERNATIONAL EVOLUTION OF LEARNING IN EUROPE

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6.1: 'General activities of observation and analysis'

REPORT OF WEAK SIGNALS SURVEY ON NATIONAL AND INTERNATIONAL EVOLUTION OF LEARNING IN EUROPE

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SUMMARY

The Leonie Project carried out Weak Signals Survey in order to collect opinions of national and international evolution of learning in Europe. Weak signals are events that are under the surface, overlooked, but that may be signs of big evolutions. Most planning approaches, however, fail to perceive or record such signals or, dismiss them because typical evaluation techniques support only strong trends.

The Weak Signals survey consisted of two phases. In the first phase the participant's opinions on the future of education were collected using web-based signals tool. In the second phase participants were evaluating the material they created in the first phase. 380 persons took part in the signals collection phase and created 1057 signals on the evolution of education and training.

After the collection phase, the signals were filtered, i.e. test statements and irrelevant inputs were removed. 787 signals remained to be evaluated by the participants. 420 persons took part in the mapping phase. Every participant evaluated 30 signals, i.e. they mapped how important the signal was. After the mapping, every participant was asked to produce additional signals, and in total 222 new signals were created in the second phase.

After the signals have been mapped the signals tool grouped the signals in four categories based on their importance and deviation, i.e. strong signals, rather strong signals, not relevant signals and weak signals. The top 100 signals of each category were included in further analysis. However, the survey generated only 24 irrelevant signals and 18 weak signals, and therefore only these numbers of signals were analysed in these two groups. In each category the signals were clustered in eight different baskets. The baskets are the most reoccurring themes of the signals. One signal can have elements of many baskets and can therefore be included in many baskets. The baskets used in this survey were:
- Financial issues
- Lifelong learning becomes mainstream
- Internationalisation/globalisation of learning and training
- Access is important
- Gap between well-educated and poorly-educated increases
- Edutainment (games) will partially substitute education and training
- ICT in education and training
- Personalization

Strong signals (high relevance/low deviation) describe the current dominant mental model on the future of education and training. Weak signals (low relevance/high deviation) are either emerging or dissipating, i.e. potential weak signals that only some participants have considered being relevant.

Most of the strong signals were dealing with lifelong learning, ICT and personalization. By 2020 education will be technology based. Learning and training will become a life long activity and lifelong learning will be possible for everybody. Education and training will be tailored to individual needs, and students will be more responsible for learning. Learning will be more a learner's driven activity, which allows fast changes that would not be possible in a teacher's driven system.

The survey generated 18 potential weak signals. Three separate issues can be identified from the input:

- Financial issues: By the year 2020 the amount of learning will diminish because of recession. The purpose of education will be to generate profit, which will cause the depersonalisation of education and training. Only corporative universities will stay alive. One of the greater challenges by then will be to make the education so effective that it will enable young people to enter the working force earlier than at the moment to be able to support vaster economy.
- Emerging edutainment will change the education and training systems: All signals dealing with edutainment were criticizing it. According to them there would be a risk to mix real life and games. Furthermore, less attention will be paid to other teaching and training services if edutainment will be given priority. By 2020 universities and lectures would not exist any more.
- There will be no changes.
- Others: By 2020 universities and lectures will not exist anymore. Knowledge facilitators, who stimulate discussions and debates, will replace lecturers. Science will fragment and new scientific areas will probably emerge.

1. INTRODUCTION

The project 'Learning in Europe: Observatory on National and International Evolution' (LEONIE) is based upon on-going observation activities on education and training (e.g. OECD, eLIG, EUROSTAT, EURYDICE, CEDEFOP, EUN, L-CHANGE, DELOS, E-WATCH, POLE, etc.). The LEONIE project aims at contributing first to the on-going analysis of learning systems evaluation carried out by other agencies and projects, and second to the establishment of a European level observation capacity on education and training. By these means it hopes to facilitate policy orientation and to contribute to the straightening of the open co-ordination method among the member states and European institutions in the domain of 'Lifelong Learning' (LLL) and, specifically, in the achievement of the concrete long-term objectives for European 'Education and Training' (E&T). The concrete objectives of the project can be summarised as follows:

1. To identify major drivers of change, in economy and society, which effect the present and future development of education and training
2. To identify and develop a capacity to monitor the innovation processes that are taking place within education and training systems, and that are intentionally implemented by the relevant authorities and players.
3. To build and validate a series of indicators, that will allow comparisons in time and between countries, of change processes affecting education and training.
4. To establish a capacity to forecast the likely evolution of education and training in Europe;
5. To build different levels of multi-actor partnership to make the validated observation components sustainable in the medium and long term.

The LEONIE Project carried out Weak Signals Survey in order to study national and international evolution of learning in Europe. Weak signals are events that are under surface, overlooked, but that may be signs of big evolutions. Most planning approaches, however, fail to perceive or record such signals or, dismiss them because typical evaluation techniques support only strong trends. Weak Signals are deemed weak not because of lack of importance, but because they are weak enough to be obscured by other irrelevant factors or dismissed as inconsequential by quantitative extrapolations. In business, they are actually very important, because recognizing them may make the difference between success and failure of an enterprise. Identifying weak signals and their potential importance is not an easy task: Weak Signals only have the potential to be amplified if they are part of a complex adaptive system. To carry out Weak Signals survey, LEONIE-project used web-based tool developed by Fountain Park Ltd.

2. METHODOLOGY[1]

Background

The Fountain Park Signals Tool integrates three different theoretical frame works. The environmental monitoring and scanning requirements of uncertain dynamic operating environment defined in Complex Adaptive Systems Theory (CAS), the modification of Delphi theory and a method of cognitive mapping. The operationalization is able to meet both the requirements of interpretation independent qualitative research and the analyzability of a large amount of quantitative research.

CAS sets the requirements for more profound scanning/monitoring of operating environments

The organizations are to meet the uncertain dynamic environments that are more complex than before. As the turbulence and discontinuity of the operation environment is increasing, it will create a growing demand for forecasting and proactive operations of the major players in the market. The Complex Adaptive Systems theory sets the requirements for information acquisition from the operating environment.

Delphi application

The Signals tool is a modification of the Delphi technique. Tool collects participants' opinions on the issues under consideration as stories (their own narratives), which the participants can give as input for the first phase of the inquiry process. In the next phase participants are evaluating the same material, signals they created (Figure 1). In most cases there is no need for manipulating (editing, filtering) the material. All these phases are anonymous, and therefore the method is able to avoid the power filter (Igor Ansoff 1986) that has a tendency to narrow the diversity of the input and evaluation.
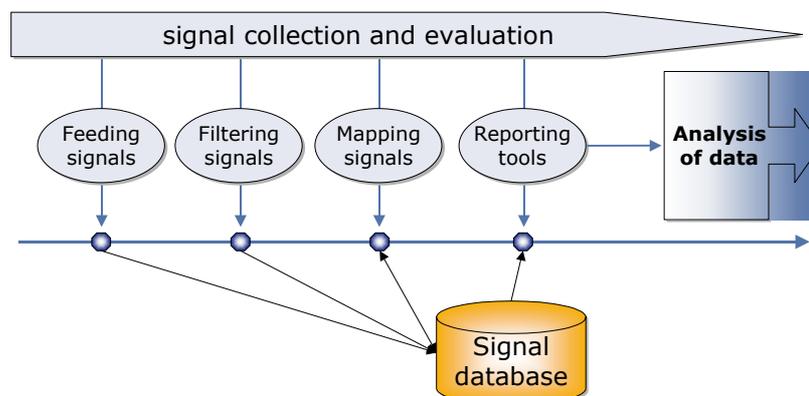

Figure 1. Structure of signals collection and analysis[2].

[1] Ilmola, L. 2004. Identifying the mental model and collecting weak signals. Fountain Park Ltd.
[2] Source: Fountain Park Ltd.

Filters

The nature of the traditional strategic planning process has strong built-in filters that usually filter novel information out of the process. In order to create an effective scanning method, it is import to understand these filters to be able to open them or close them, if needed.

A clue from the external environment, a weak signal, has to pass three different filters in order to create an impact on the strategy process (Figure 2). The observation filter (surveillance filter) defines the area we are observing. The cognitive filter (mentality filter) is used for evaluating the novel issue that has passed the observation filter. Has this issue any meaning to us? Is it important for our strategy? The cognitive filter is formed from previous (success) experiences and we have a tendency to filter the novel issue off, because it has not been of any importance earlier.

The power filter is activated when the same management team that has been responsible for the corporate strategy decodes whether the novel issue has to be considered in the new strategy or not.
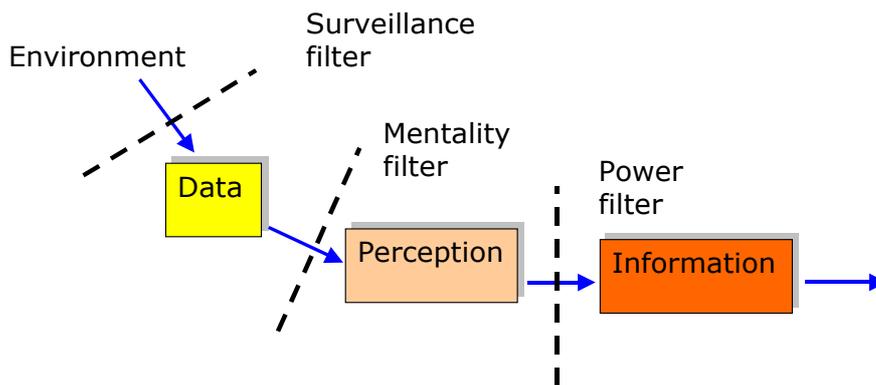

Figure 2. The traditional strategic planning process has strong built-in filters that often filter novel information out of the process[3].

Cognitive mapping

The method of the evaluation phase of the Signals tool is an application of cognitive mapping. It is a cause map where participants are asked to arrange the signals (issues) under consideration according to their relevance on the reflected issue. In the cause mapping the participant is asked also to draw causal linkages from the presented signal to another. In this simple application the relevance consideration is sufficient. In order to collect tacit, intuitive and attitudinal information the tool is aiming at a non-analytical approach; the participants are asked to run the evaluation according to their feelings and no argumentation is requested.

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[3] Source: Fountain Park Ltd.

What do the reports tell us?

Collected data from the evaluation phase is based on one aspect, the distance of the evaluated signal from the center of the cognitive map. This operationalization provides us quantitative information on qualitative material. The relevance figure is the only collected information. The nature of the material and evaluation process do not allow any thorough statistical analysis. In addition to the relevance figure the tool provides us only with the deviation information that describes the degree of relevance agreement among the participants.

The strength of the reporting is that the tool maintains the preliminary/original expression that the participants have used at the beginning. So the researchers impact on the material is minimized and there is no need for researcher intervention until the results analysis phase.

The results tell us two issues. The high relevance/ low deviation quadrant of the grid report describes the current dominant mental model of the issue (issues that participants agree to be the most relevant) and low relevance/high deviation quadrant lists issues that only some of the participants have considered to be relevant. These signals are either emerging or dissipating (Figure 3).
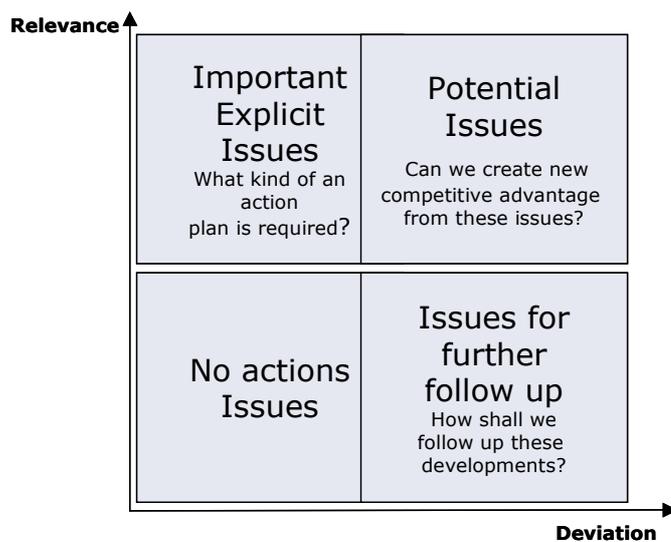
Figure 3. Potential weak signals are those with low relevance and high deviation, i.e. issues for further follow up. Strong signals are those with high relevance and low deviation, i.e. important explicit issues[4].

In order to check that all the evaluated signals have sufficient evaluation (in some cases the signals are chosen randomly for each participant's cognitive map) the tool reports also the number of evaluations per signal. The tool does not report the results according to a background variable if there are less than 10 participants within that specific background variable.

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[4] Source: Fountain Park Ltd.

3. TARGET GROUPS

The Weak Signals method as bottom-up forecast survey is targeted to specialised 'communities of practice' and their practice-based or procedural knowledge and culturally defined 'life worlds' (learners, parents etc. with their tacit and practical knowledge). The target groups of the weak signals survey of the LEONIE project were as follows.

1. PROVIDERS OF EDUCATION AND TRAINING SERVICES
   a. Teachers
   b. Faculty
   c. Training providers
2. USERS OF EDUCATION AND TRAINING SERVICES
   a. Learners
   b. Students
   c. Parents
   d. Potential learners
3. POLICY MAKERS AND ADMINISTRATION
   a. Administrators
   b. Rectors
   c. Ministry of education
   d. Municipal level

The invitation to take part in the survey was sent to about 80 potential respondents of each partner country, i.e. Austria, Finland, Germany, Greece, Hungary, Italy, Spain and Romania. The invitation to take part in the Weak Signals Survey was also published in the following www-sites:
http://www.education-observatories.net/leonie/
http://www.trainingvillage.gr
http://www.cedefop.eu.int
http://www.bildungsserver.de

Furthermore, the invitation was sent to the following mailing lists:

- EDEN

- FIM-NeuesLernen

- eLehren und eLernen in der Lehrer-Aus- und Weiterbildung (eL3)

- Berufliche Weiterbildung zur Anpassung an moderne Arbetsmittel und -abläufe (BeAA)

- Deutscher Bildungsserver (DBS)

- LernMIT

- Zentrum für Fernstudium und Weiterbildung (ZFW) an der Universität Hildesheim

- ¡Business (HighText)

- Deutscher Multimedia Verband (DMMV)

- Schulen ans NETZ, Lehrer-Online

- e-nitiative.nrw: Network for Education & European Institute for the Media (VHB)

- n-21: Schools Online in Lower Saxony

- Virtuelle Hochschule Bayern (VHB)

4. SIGNALS COLLECTION PHASE

To collect views on potential factors influencing the evolution of education the project used web-based Signals Tool. The collection of signals was based in various creativity techniques. Ideas of respondents were collected by using three different templates. Respondents were asked to give a short and long description of each idea. The main question of the survey was: "What changes education and training by the year 2020?" In the first template only the main question was presented.

In the second template the main question remained the same, but this time there were some additional challenging comments or questions in order to make the respondent's ideas flow freely. These were as follows.
- All learning services are available online anywhere anytime...
- Anyone can be a teacher...
- University degrees will be replaced by standardized competency profiles...
- University education will face severe inflation...
- The world would be a network of highly specialized experts, what could this mean to the future of education and training...
- All member states of the European Union will have standardized educational systems...
- In 2020 there will be no need for schools or other learning institutions because majority of Europeans are senior citizens
- All tertiary level graduates are female...
- Emigrants from outside the EU will balance the demographic changes...
- If learner would be responsible for innovations, what would be the future of education and training?

In the third template the main question remained the same, but this time there were some additional comments and questions to stimulate respondents' creativity. The stimulating comments and questions were as follows:
- The greenhouse effect is accelerating.
- The population of Europe is rapidly ageing.
- Water becomes the most valuable property of a country.
- Earth gravitation is rapidly decreasing.
- Living under water becomes extremely trendy.
- Bungee jumping is the no1. European policy.
- Aliens are managing our businesses.
- Self Service will conquer the world.
- People are seeking danger and survival games.

The web-based tool for the collection of signals was opened on the 12th of December 2003 and closed on the 13th of January 2004. 380 persons took part in the signals collection phase. 220 respondents were male and 160 female. 86% of the respondents were European. The number of respondents per country is presented in the Annex 1. In total the participants produced 1057 signals on the evolution of learning.

Respondents' main role in education and training is described in the Figure 4. The three biggest respondents groups were teacher/faculty (137 respondents), researchers (96 respondents) and administration/management (87 respondents).

Figure 4. Respondents' main role in education and training.

Figure 5 presents respondents' experience in education and training. The biggest respondents' group were the most experienced ones. 166 respondents have over 20 years experience in education and training.
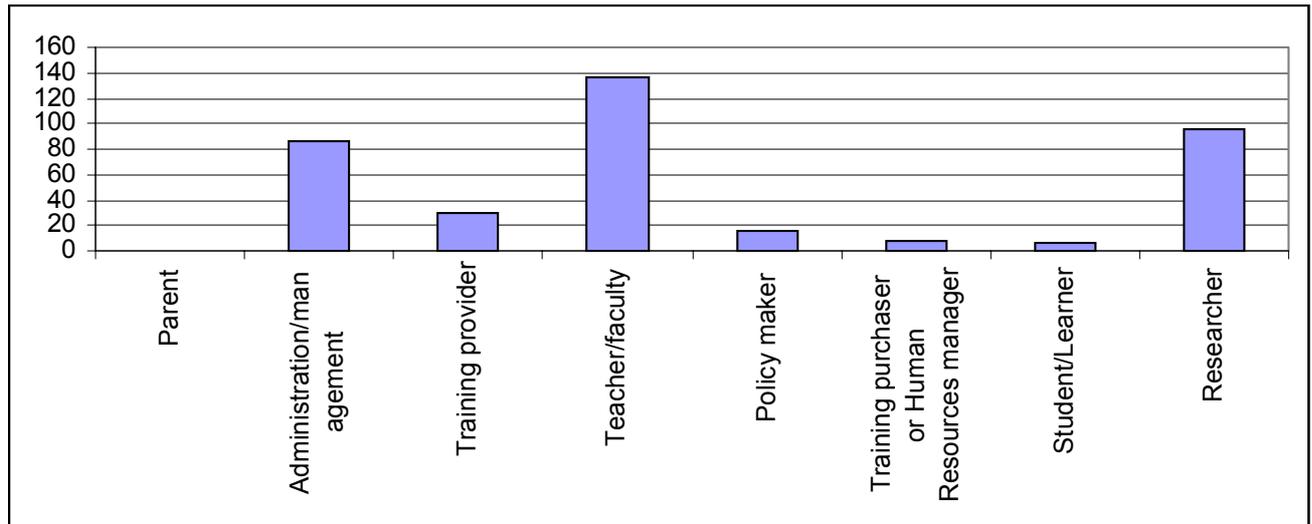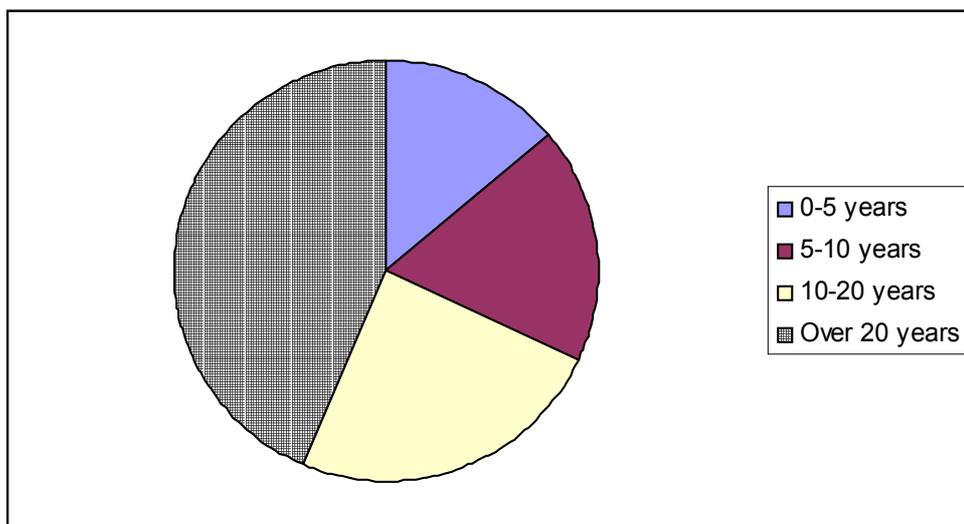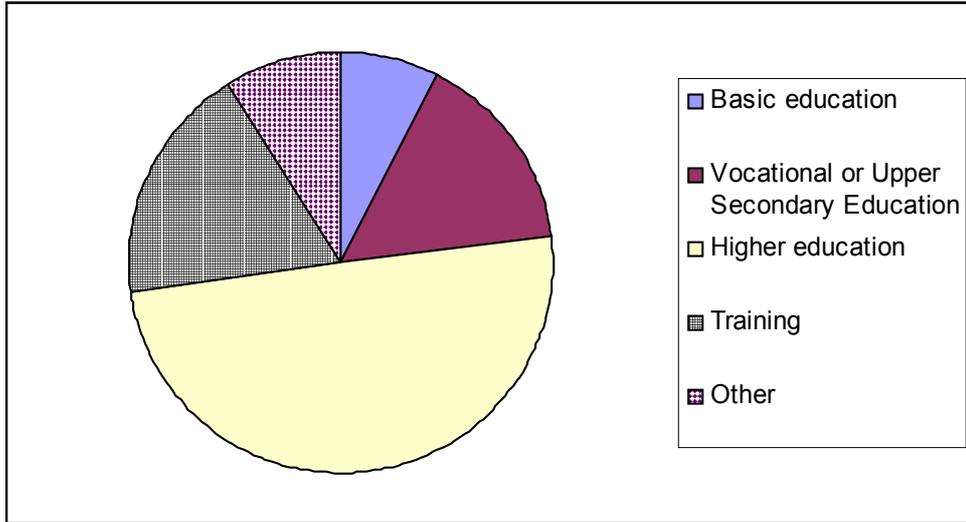

Figure 5. Respondents' experience in education and training.

Figure 6 presents respondents area of education and training. The biggest respondents' group was higher education corresponding 270 participants in the signals creating phase.


Figure 6. Respondents' area of education and learning.

5. MAPPING PHASE

Fountain Park Ltd and HUT processed (filtered) the signals collected using the web tool. In the filtering process approximately 270 signals were removed. These signals were test statements or irrelevant input such as "I don't know". In the initial filtering of the signals, i.e. after the irrelevant inputs were removed, about 800 signals remained to be mapped. HUT did not rewrite the remaining signals, but let them be as they were in order to avoid using power filtering.

After the filtering the site was re-opened and the participants were invited to assess the signals. The site was re-opened for mapping on the 26th of January 2004 and closed on the 25th of February 2004. In the second phase about 420 persons mapped the signals produced in the first phase. The numbers of respondents per country are presented in the Annex 2. Every participant evaluated randomly 30 signals, i.e. they mapped how important every signal was. This "voting" was done using a graphical drag-and-drop –interface. After the mapping task, every participant was asked to produce additional signals. In total 222 new signals were created in the second phase.

Figure 7 presents respondents' main role in education and training. The biggest respondents' group was teacher/faculty corresponding of 194 respondents.
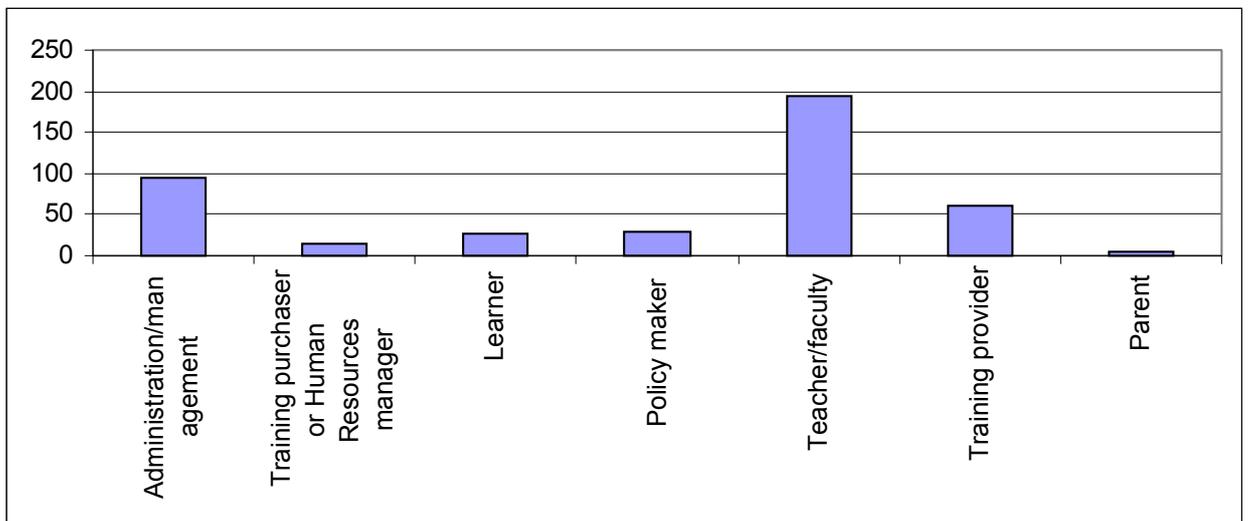
Figure 7. Respondents' main role in education and training.

Respondents experience in education and training is described in the Figure 8. The biggest respondents' group were the most experienced ones. 149 respondents had over 20 years experience in education and training.
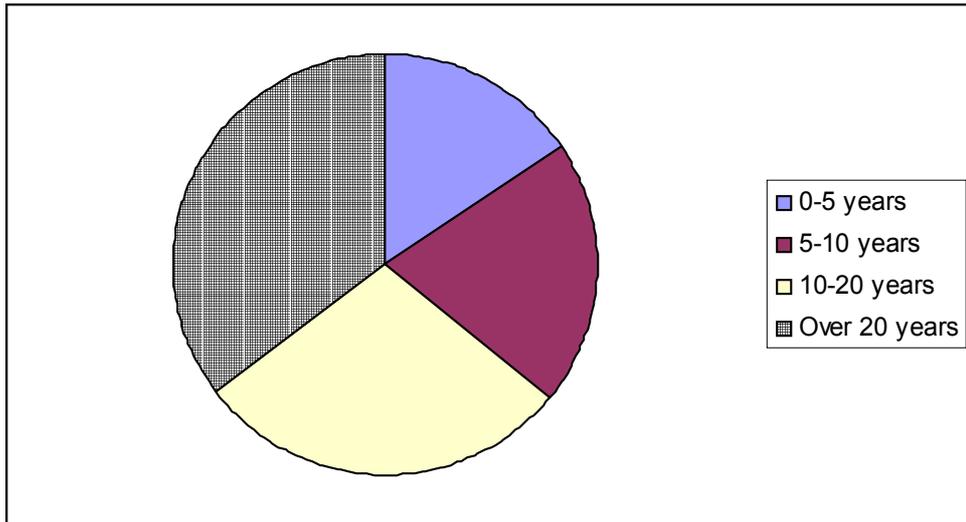
Figure 8. Respondents' experience in education and training.

The Figure 9 presents respondents' area in education and learning. The biggest respondents' group was higher education corresponding 281 participants in the signals mapping phase.
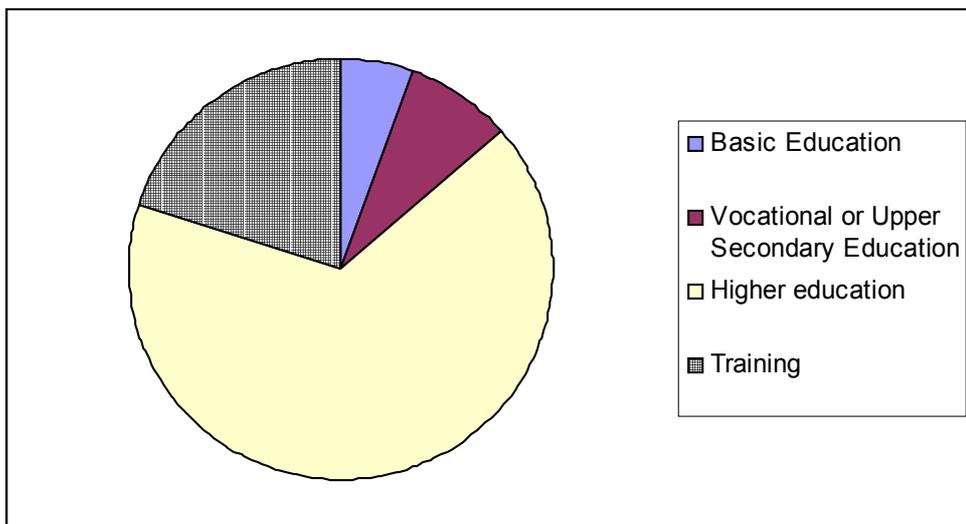
Figure 9. Respondents' area of education and learning.

After the signals have been mapped, the Signals tool groups the signals in four categories based on their importance and deviation (Figure 10). Importance in the Weak Signals Survey is the distance from the mid point. The shorter the distance the more important is the issue. Deviation in the Weak Signals Survey is the standard deviation of the issues measured in relation of the mid point. The report of these four categories is called a grid report.

Figure 10. According to the results of the "voting", the Signals tool groups the signals in four different categories, i.e. strong signals, rather strong signals, not relevant signals and weak signals.

Figure 11 presents the grid report of top ten signals of each category, i.e. strong signals, rather strong signals, not relevant signals and weak signals.

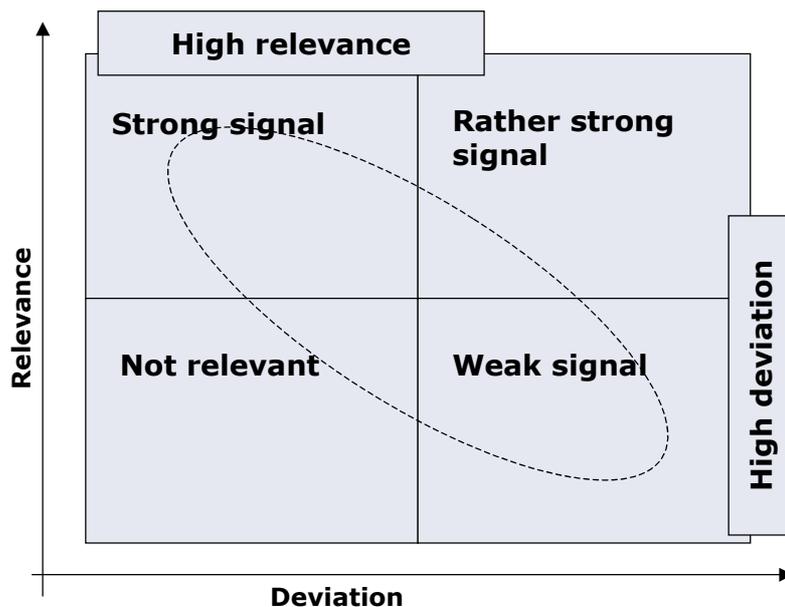| **Strong signals** 1	**Rather strong signals** 2
TOP 10: High relevance, low deviation	TOP 10: High relevance, high deviation
1. Learner-driven education	1. Education will be technology based
2. Personalized, just-in-time learning	2. More foreign pupils
3. learning skills	3. Broadband, multimedia and support available
4. The input of learners in the educational or learning process	4. automated learner feedback
5. Training that is mobile	5. Education will be a continuous part of people's life.
6. Increase in digital literacy	6. innovation and knowledge development
7. Learning and training will become life long human activity	7. An open minded cosmos without prejudices & racist activities
8. Lifelong learning will be possible for everybody	8. The priority and the money, the society gives to education
9. Continuous information management for the individual	9. Employment type will change
10. Facilitated access to data, information, knowledge	10. In Collaboration

Not relevant signals 4	**Weak signals** 3
TOP 10: Low relevance, low deviation	TOP 10: Low relevance, high deviation
1. Only virtually	1. Search for "authenticity" will take many forms
2. terrorist	2. No change
3. mainly on TV to look at.	3. Life is no game.
4. Nokia and other mobile operators offer solutions	4. The moon will have fallen down
5. innovation is an American myth	5. Depersonalization of education and training
6. The greenhouse is accelerating as needs are not limited	6. Danger as leisure!
7. the aliens	7. Degradation
8. Due to insecurity in real life and transferrance factor	8. Less attention to teaching and training services
9. Teachers Union wont accept	9. This is escapism in a safe haven.
10. Risky processes	10. Why danger?

Figure 11. Grid report of top ten signals. This report shows the titles of the top ten signals of each category (strong signals, rather strong signals, not relevant signals and weak signals).

From further analysis the LEONIE project used top 100 signals of each category. However, the survey generated only 24 not relevant signals and 18 weak signals and therefore only these numbers of signals were analysed in these two groups. In each category the signals were divided in eight different groups, i.e. baskets, which are the reoccurring themes of the signals. In this survey the baskets were:

- Financial issues
- Lifelong learning becomes mainstream
- Internationalisation/globalisation of learning and training
- Access is important
- Gap between well-educated and poorly-educated increases
- Edutainment (games) will partially substitute education and training
- ICT in education and training
- Personalization

The number of each signal type in different baskets is presented in Table 1. In the mapping phase the participants were also asked to create new signals. In total 222 signals were created in the mapping phase. The new signals were also grouped into baskets for further analysis.

Basket	Strong signals	Rather strong signals	Not relevant signals	Weak signals	New signals
Financial issues	5	5	1	7	10
Lifelong learning becomes mainstream	26	15	5	6	35
Internationalisation/globalisation of learning and training	12	11	0	0	32
Access is important	10	2	1	0	10
Gap between well-educated and poorly-educated increases	8	4	3	0	11
Edutainment (games) will partially substitute education and training	3	3	3	0	1
ICT in education and training	35	30	7	2	104
Personalization	30	45	0	0	44
Others	3	4	6	5	26

Table 1. The top 100 signals of each signal type were grouped in different baskets. One signal can be included in several baskets.

6. STRONG SIGNALS

Strong signals are those of high relevance and low deviation. They are issues that participants of the Weak Signals Survey agree to be the most relevant. The Weak Signals Survey on the evolution of training and education produced 356 strong signals from which the top 100 signals were selected for further analysis. The summary of the signals included in different baskets is presented below.

Financial issues

Five strong signals dealt with financial issues. The main message is that education will become private business. This will improve the quality of education, since paying clients would no longer accept low quality education. Costs of studies such as engineering studies, where part of lab exercises and project-oriented studies can be carried out using Web-based tools, will reduce.

Lifelong learning becomes mainstream

26 strong signals were describing the increasing importance of lifelong learning. By 2020 learning and training will become a life long activity and lifelong learning will be possible for everybody. Mature students will put higher demands on the education system, which will improve the quality of education. There will be many different ways and opportunities of learning and training from which one can choose and compose the most suitable combination. Distance/flexible learning – studying at one's own pace and independent of place will be more common.

Learners will be responsible for life long learning, and education will become more flexible and student orientated. In addition, life-long learning will require new ways of training focusing on learning how to learn.

Communication technology will allow ubiquitous access to data, information and knowledge. Access to learning resources and learning communities will become easy. Adults will learn in collaborative communities of peer-to-peer, cross-cultural and community type of learning. Access to learning resources and learning communities will become easy.

University will be near the society and give people skills how to transform information into practical knowledge. The importance of school and university will diminish, since more learning can take place at workplace with the web-based technology. In the working life training periods alternate with working periods.

Internationalisation/globalisation of learning and training

12 strong signals were forecasting the internationalisation/globalisation of learning and training. By 2020 higher education institutions will become international ones in terms of students, teachers and distant services. Learning will be on-line and it will be possible to carry out i.e. lab exercises or projects of project-oriented studies with web-

based tools. In some faculties learning will be multi-lingual and students will take their courses partly in domestic and partly in other faculties.

By 2020 it will be possible to take courses/education globally, i.e. to participate in a global network of learners choosing a supervisor/teacher of one's own taste. This will lead a global competition between universities. On the other hand, there will be more recognition of cultural differences and international collaboration tailoring resources between countries.

There will be no need any more to go to a special house or class to learn. The school will be virtual and worldwide. The fact that companies do business more internationally also requires education to be oriented this way. The importance of language abilities will grow. Due to globalisation different education systems will gradually approach each other. By 2020 education will provide means to resolve problems connected with health, disease, living within the limits of resources and migration to other worlds.

Access is important

Ten strong signals were dealing with access to education and training. In the future access to learning resources and learning communities will become important, because education and training will be more distributed and de-centralized. People will learn either in small communities or isolated at home or in the workplace. Communication technologies will allow ubiquitous access to data, information and knowledge.

Gap between well-educated and poorly educated increases

Eight strong signals were dealing with the gap between well-educated and poorly educated persons. By 2020 social division may consolidate the division in education. In the future education will be more and more a private business. Thus the gap between well-educated and poorly educated people will grow bigger. This development is taking place both between countries and inside one country. Equality in education is a myth, promoted by politicians at local and global level.

Edutainment (games) will partially substitute education and training

Only three signals were dealing with edutainment. By 2020 learning will be based on computer-based tools such as CMC, VLEs and digital games. Game-based learning will be one way of learning in the future. If people really need to face simulations of danger, this desire must be incorporated into education and training by e.g. incorporating real-life scenarios for survival in business or industry into training/education.

ICT in education and training

35 strong signals were dealing with ICT. By 2020 eTechnologies will be everyday teaching practice in education and training. Multimedia technologies will give opportunities to teachers and students to be on remote places during lectures. The use of new technologies will influence the process of teaching/learning by introducing a completely different approach, creating new models and innovative tools. This means that those working as learning providers e.g. university, training companies, workforce development departments will need excellent technical and communication skills.

ICT fulfils the four basic necessities of modern education and training: velocity, availability, continuous renewable and multimedia. The school will be virtual and worldwide. ICT will enable adults to learn in collaborative communities worldwide. Mobile lifestyle will be a common feature of learning in 2020.

ICT will offer to learners new ways to collaborate in HE with mentors, tutors, coaches, gurus etc. and other students. Blended learning is a fundamental restructuring of the education transaction. The transformal power of blended learning is that it is consistent with the values of traditional higher education and has proven potential to enhance both the effectiveness and efficiency of meaningful learning experiences.

In the web-based environments learners become co-designers of their shared learning environment. By 2020 learning will be based on digital media and books will play a minor role.

Training will be mobile and education will not have the semester structure that it has at the moment. The technology to support more effective learning is already available, but the ratio of non-traditional learners in HE institutions will increase changing its rigid system.

Knowledge-based society needs highly qualified workers with both technical skills and the ability to organise information and cooperation. Education must be reshaped to meet these requirements. New school subjects related to he personal organisation of knowledge will be developed. New professions will be responsible for organisation of knowledge in enterprises and administrations.

The knowledge society will need multi-skilled persons. "Knowledge workers" must be able to distil, generate and mediate knowledge (not information). A new set of learning techniques is needed to train people to work in virtual enterprises. However, technology will never substitute for fundamental human needs to deal with other people in rich, warm and caring relationships.

Personalization

30 strong signals were dealing with the personalization of education and training. By 2020, learning will be customised to a level that allows learners personally and

individually direct their learning according to their specific needs. Learners will be buyers in the educational market and thus educational institutions will have to become more aware of their needs. Learners will become co-designers of their shared learning environment. Training will be tailored individually and developed and changed through the learning process. Training will be available where a student wants it.

By 2020 there will be a serious move towards tailored education and training to individual needs. This means also that students will be more responsible for their own learning. Training will be more a learners driven activity, which allows fast changes that would not be possible in a teacher driven system.

Education should continue to maintain cultural diversity. We should learn each other, but not to be like each other. Resource banks of high quality material can be shared worldwide and international collaboration between institutions give possibilities to tailor resources between countries.

Self-learning competence will be very important when learners will use more personalized ways to learn. Self-diagnostic tools will determine learning styles so that people will be able to efficiently plan their studies. Traditional hierarchies will change to teamwork and knowledge sharing leading to the fact that managers, leaders etc. roles will be taken more as job than status issues.

The specialization of studies will take place earlier. Just in time learning may lead to minimized survival learning – just in time, but also just enough. In the world that keeps on changing faster and faster, "just enough" may soon become "just not enough".

7. RATHER STRONG SIGNALS

Rather strong signals are possibly important issues with high relevance and deviation. They tell what is likely to be important in the year of 2020. The Weak Signals Survey on the evolution of education and training ranked 366 signals as possibly important issues. The top 100 signals were selected for further analysis and grouped into different baskets. The summary of the rather strong signals included in each basket is presented below.

Financial issues

Five signals were dealing with financial issues. By 2020 education will be linked with economic objectives. People will be trained in skill shortage areas. Government will fund only basic education, and student will have to pay for other type of education. Thus a carrot and stick approach will guide learners through training paths to meet the key economic needs. Long life education will be a major industry in post-industrial society.

Lifelong learning

15 signals were describing the increasing importance of lifelong learning. The goal of education will be to enable lifelong learning. By 2020 we will all be learners and training will be an embedded part of the workplace. More attention will be paid to the knowledge and capabilities of those people who can act as mentors for other employees on site.

On the other hand, we all do best learning when we are in the role of teaching. We will need critical skills to evaluate the information flow and to place a piece of information in a context to make smart decisions. By 2020 education and training will be multidisciplinary and people must be more mobile and able to adapt to frequent changes in professional life.

Internationalisation/globalisation of learning and training

11 signals were describing internationalisation/globalisation of learning and training. The intercultural education and learning will help us to change educational standards and be more creative and open-minded. Because of the mobility along countries, there will be very heterogeneous students studying together. By 2020 there will be a standardised learning modules for worldwide use. When learners can choose worldwide where to study, the competition between education providers will increase. Due to globalisation education will stress the importance of developing skills and abilities to become more productive and efficient.

Access is important

Only two signals were clearly dealing with access. By 2020 there will be learning networks with free or cheap access. This network will organise the exchange of learning and teaching so that a learner can access to learning just when he/she needs it. However if people work and study only isolated from each other, this may cause problems in the long run.

Gap between well-educated and poorly educated increases

Four signals were dealing with the increasing gap between well-educated and poorly educated people. Highly advanced technique will divide people into different categories based on skills they have. This will lead to a permanent high number of unemployment. As learning will be more privatised the digital and learning divide will increase. Primary and secondary education will be strained with fewer resources in relation to the requirements of the society. This will lead inequality, e.g. in the previously very equal school systems in Nordic countries. While more and more learning services will be available on-line in rich countries, a big number of real-life based and traditional learning services will play an important role especially in the less industrialized countries.

Edutainment

Only three signals were dealing with edutainment. By 2020 danger and survival games will be used in teaching process, but they will not be the main vehicles for education. In the long run more and more education will be provided in the form of entertainment and games. Simulation tools will be used to learning by doing.

ICT in education and training

30 signals were describing ICT in education and training. By 2020 education services will be on-line and available everywhere. Technological tools will use all available media, and perhaps others like smell, taste and tactile functions. Students will undertake individual and group creative projects using all tech tools available. Furthermore, technology supported learning enables learner to have instantly automated feedback.

Collaborative learning and joint on-line seminars will be central parts of learning. Students will be distributed in local clusters to obtain social learning and these clusters will then be connected on-line.

The electronic portfolio will become a common format at all levels of education and replace university degrees. The ePortfolio may contain interactive multimedia data and will thus impact on traditional pedagogical models and infrastructures. Graphics and movies will become more and more important in learning.

ICT will change both the form and content of education. By 2020 there will be multiple learning environments and multiple possibilities. In vocational training high technology will result in the centralisation of training. ICT will form the education and training to be more project-oriented with networking between groups. The fusion of both science and technology are vital and key areas that lead to changing paradigms in education. Technology leads to the development of new learning environments, and plays a key role in supporting diversification of students.

However, new technologies are just learning aids. They can never release the learner from asking questions, developing interest and investigating things. The learners are responsible for detecting innovative ways for using tools and being creative with the things given. Evolving more and more technological and abstract environments into education and life may drive us back to nature, i.e. back to do things in education as much as possible in natural ways.

Personalization

45 signals were dealing the need of personalization of education and training.
By 2020 creativity will be more important than memorised knowledge. In the middle of the information flow, the most important thing will be to know how to find the solution. Students will undertake individual and group creative projects. Project learning will increase. Projects are an efficient way to transfer and connect knowledge of different areas. The learner will be the centre of the learning process and will have more autonomy and responsibility of the development of his/her learning process.

The curriculum of students will be more flexible and the amount of material taught by a teacher will decrease. The core curriculum will be reduced and the boundaries of subjects will be fuzzier. This will allow students to make more decisions and get more freedom to determine the tasks they will complete to achieve the outcomes or objectives of the system. Students will take part in deciding how to achieve the standards or objectives and the curriculum will no longer be "secret teacher's business". The teachers role will be to guide, facilitate, advice, challenge and intervene when and where they believe it is necessary or when students ask them to do so. Mentoring system will facilitate the learner's process and choices.

Innovation will be much facilitated by a "client or learner-driven system" and one should expect quicker "creative destruction" cycles than when the producer, and the administrator (often serving huge national bureaucracies) were steering the system.

Today schools and training providers are the main obstacle to build a learning society. By 2020 the model of force-feeding knowledge, control and command has been changed to a model centred on valuing individuals belonging to various learning communities, having control on the management of their own learning. At the moment education seems to lagging behind, i.e. providing skills, which may be out of date. Teachers will be responsible to guide and facilitate learners in finding the needed information or skills more than filling students with information they will never need in the real life.

Learners will take responsibility for discovering the ways and means in which they learn best. Innovations will arise as new methods or different approaches become better understood and shared. Experience-based learning process will be more important, because deep emotional structure of learning processes will be recognised as fundamental. The importance of self-learning will increase. Learner is his/her own best teacher, because in any situation the learner will learn just those things that are relevant to him/her in that situation.

By 2020 the common feature is to mix education and work, because there will be frequent changes in professional life. School education should stop at the age of 12-14 and leave room for a combination of work, education, cultural, political and social activities making it possible to include people of all ages in a leaning society. This makes young people to be self-confident and to have responsibility for the world.

8. NOT RELEVANT SIGNALS

Irrelevant issues are signals with low relevance and low deviation. The summary of the not relevant signals included in different baskets is presented below. The survey generated only 24 irrelevant issues.

Financial issues

Only one irrelevant signal was dealing with financial issues. The fact that education will be business was considered to be irrelevant.

Internationalisation/globalisation

Five irrelevant signals were dealing with internationalisation/globalisation.

Acting as responsible people with respect for culture, nature, comfort and altruism, actual living and future world seems to be difficult and demanding. The world will need citizens that cultivate new values and shared responsibilities, not only in terms of space and place, but time as well. Long-term responsibility will be a new way of solidarity with human beings who are not yet born.

The cultural differences will boost socio-technical education.

By 2020 most of the countries follow science rather than religions in education and training.

Mankind must learn from its errors and teach e.g. how to observe slow changes such as greenhouse effect.

Access

Only one irrelevant signal was dealing with access. According to it, there will be universal access to mobile personal learning environments by 2020.

Gap between well-educated and poorly educated people

Three signals were dealing with gap between well-educated and poorly educated people. They presented contradictory future paths. On the one hand, places, actors and resources for instruction and learning will be distributed more evenly. On the other hand, those who can, send their children to private education, thus widening the social gap further. New intellectual elite, that has similar impact as Marx did in his days, may emerge.

Edutainment

Three irrelevant signals were dealing with edutainment. According to them to use dangerous and survival games in education and training may make societies to be more violent. Edutainment will be one way to escape to fantasy world when people are facing situation they find difficult to handle.

ICT

Seven irrelevant signals were dealing with ICT. According to them online training will help extremists to prepare themselves to destroy our civilisation.

Learning will be much deeper when all education will be on-line. Furthermore, with the help of ICT it will be possible to deliver tailored education to an individual learner. However, through the efficient use of ICT isolation will become a social problem.

In the future nobody is responsible for the quality of one's knowledge and increase in technology may draw us back to nature.

Personalization

Two irrelevant signals were dealing with personalisation. According to them with the help of ICT it will be possible to deliver tailored education to an individual learner. Teachers will teach students to act as entrepreneurship, i.e. to be critical with the information flow to be able to integrate innovation in the real life.

Others

According to the rest of the signals schools may be obsolete in the future, and universities will convert from teaching institutions to mere research institutions. The survival of institutions will depend on their capacity to implement the right changes.

9. WEAK SIGNALS

Weak signals are signals with low relevance and high deviation. In the Weak Signals Survey they are signals, which only some participants have considered to be relevant. These signals are either emerging or dissipating, i.e. they are potential weak signals. The Weak Signals Survey produced 18 potential weak signals on the evolution of education and training. The summary of the weak signals included in different baskets is presented below.

Financial issues

Seven weak signals were dealing with financial issues. According to them the amount of learning would diminish because of recession. In the year 2020 the purpose of education would be to generate profit, which would cause the depersonalisation of education and training. Only corporative universities would stay alive. One of the greater challenges by then would be to make the education so effective that it would enable young people to enter the working force earlier than at the moment to be able to support vaster economy.

Edutainment

Six weak signals were dealing with edutainment (games) in education and training. All these signals were criticizing edutainment in one way or another. According to them there would be a risk to mix the real life and games. Furthermore, less attention would be paid to other teaching and training services if edutainment would be given priority.

ICT

Two signals were dealing with ICT. According to one signal the Internet providers would be the weak chain. The other signals stated that virtual work and learning environments and virtual social communities would push individuals to create many identities.

Others

Three weak signals described new ways of learning mainly related to the universities. By 2020 universities and lectures would not exist anymore. Knowledge facilitators, who would stimulate discussions and debates, would replace lecturers. Science would fragment and new scientific areas would probably emerge.

One of the signals stated that there would be no change in the education and training by the year 2020, while others reflected some kind of changes to take place.

10. NEW SIGNALS

In the mapping phase the participants were also asked to create new signals. In total 222 signals were created in the mapping phase. For further analysis the new signals were grouped into the same baskets than mapped ones. The summary of the signals included in different baskets is presented below.

Financial issues

Ten new signals were dealing with financial issues. By 2020 adult learners will increasingly control learning. They will control a significant part of the funding. Due to increased specialised education (experience learning) adapting to the (economic) needs of the world market, the learner's development of critical thinking and selfreflexivity competence will be a secondary goal in the education process. Funding for higher-education and training continue to lag in respect to GNP spending in other areas. The long-term health of an economy depends on the education/training of its population, but governments will fail to recognise the importance of long-term goals from short-term goals.

International merges are continuing and thus economy is heading towards global monopolies. Unfortunately the interests of these monopolies are very one sided. This bears the risks of loosing the idea of knowledge as an object, replacing it by the idea of knowledge, as a tool to respond to market needs.

Tuition payments will be standardised internationally.

Lifelong learning

35 new signals were dealing with lifelong learning. By 2020 there will not be enough job opportunities and therefore people will have shorter working days. The need for intellectual stimulation will promote patterns of learning throughout life. People have to learn lifelong in order to live and thus learning will be less associated with school, but more associated with socio-constructivist notions on learning as creating meaning. Education will be integrated into living.

The rate of change in all aspects of life, personal and professional, will require constant learning of new concepts. Knowledge is continuously updated based on sensor networks and network infrastructure.

Most of the vocational and further training will be done work process oriented. For "mobile" workers flexible and habile multi-service devices, e.g. e-paper, will be available. Face-to face seminars will be used to discuss improvement of learning methods and common problem solving, i.e. the application of knowledge.

Education and training will cost less and anytime, anywhere education and training will be accessible over high-speed mobile networks; PDA and mobile computers will become indispensable for teaching and learning. People will have access to resources they never had before. Furthermore, they will have the possibility to learn based on

different experiments. By 2020 learning will be mostly learning by doing and based on active cooperation with working life.

Lifelong learning will be needed because knowledge will have shorter and shorter life cycle. Professional knowledge is changing very rapidly and needs to be renewed ceaselessly and therefore acquisition of knowledge is not sufficient to learn. Training and education should give the learner abilities to create knowledge necessary to solve problems in daily life. Education and training will become more a service than cultural institution with a focus on skills that can be put into practice more than a "humanist heritage".

Traditional frontiers between education, lifelong learning, working and everyday life will diminish. There will be no boarders between research and practice. Everybody will be a researcher and practitioner in the sense of research, development and innovation. Careers and personal biographies will contain more phases of learning as an integral part, and business will have to acknowledge this by new employment structures.

Learning will be carried out in mixed age groups. There will be freedom to learn. Children, youth and adults have space to learn in collaboration with professionals from different level or sector of knowledge.

Internationalisation/globalisation of learning and training

32 new signals were dealing with internationalisation/globalisation of education and training. Global education standards will be developed. Globalisation will affect education profoundly. Education will be more competitive and content will be from all over the world, less influenced by national politics and history preparing learners for a competitive market. Students will be from the whole world, because education is the best way to integrate and develop a world-wide system where all people can live together and share knowledge and experiences with each other. By 2020 it will be natural to study together with people from different countries in the world by e-learning.

More and more different nations will be in one classroom. Learning will be international but standardized. World database of official recognised universities will allow the full mobility of students and researchers without having to obtain recognition of titles. By 2020 a big number of Chinese students will come to Europe, and it will face the problem to make its educational systems strong enough to manage this problem.

When more and more immigration exists in the world it can influence education through the idea that despite the traditional skills to learn there exits new one, i.e ethical and ethic questions, saving of natural resources, conflict management…ability to accept other culture, religions and ways of living.

Higher education will become a worldwide mass phenomenon, definitely losing its elitist character. Higher education must change in technical, administrative, social and cultural terms. The number of services and agencies at local, national and

international level will increase due to need of personal advising, counselling and guidance and consequently new profiles of educators will develop.

Access

Ten new signals were describing the access to the education and training. New technology will definitely help everybody to get access to a better education and trainers/teachers will also take advantage of them improving their skills and experience. Anywhere anytime education and training will be accessible over high-speed mobile networks. Mass access to higher education will definitely make it loose its elitist character. It will be more and more difficult to distinguish between campus students and distance education students. As access grows so does the potential to reach new and often underserved populations. Our challenge is to encourage this growth and find ways to underwrite access at all demographic and economic touch points. However, easy access to reference information may make traditional education less relevant: everybody will be able to "look it up" electronically.

Gap between well-educated and poorly educated increases

11 new signals were describing the gap between well-educated and poorly educated people to increase. By 2020 the new and increased learning opportunities due to new technologies will lead to a growing knowledge gap along geographical, cultural, economical, political, religious etc. borders. The important question is how much effort we put into education and how this effort is divided between different social and geographical groups. European Union might distribute resources more evenly than many countries nowadays, but we are facing the pressure to diminish public sector, which means less resources and danger of private sector education for rich people.

Students will act in more innovative ways when learning. Probably there will be a greater gap between those who manage and those who not manage more open tasks and open resources. There will be increase gap between people who can learn and those who cannot.

Mass access to higher education includes the necessity to rethink the division between very small, very expansive institutions and broadly accessible institutions. This division could become deeper, thus creating political cleavage. On the other hand the division could become smaller enabling higher education to play an integrative role.

Edutainment (games) will partially substitute education and training

Only one new signal was dealing with edutainment. According to it by 2020 education will be obtained with effort but also with fun. New pedagogic methodologies, supported by multimedia technologies will create the additional hype and motivation.

ICT in education and training

104 new signals were dealing with ICT in education and training. By 2020 the Internet will have much more importance in education. Students will rely more and more on the computer and go less to school. Exams will take place on-line. Digital portfolios will replace traditional diplomas. Personal DPFs may evolve to a standardized database structure. Personal DPFs may be embedded in professional and other databases. Practical uses will be developed for eLearning. Televirtuality will be another strong trend combined to prior.

There will be more self directed and web-based education. The formal education will not play significant role any more. The family and different groups will be most important educators, which will use the technology for realisation of their goals.

Traditional accumulation of knowledge is no longer necessary, but creativity for problem solving based on an ability to understand basic principles and relevant details. Thus education and training have to provide authentic and exemplary learning opportunities by which the learner is activated to gain knowledge and methodological competence so that the accomplished state of knowledge can be further developed according to new demands. Digital media is almost irreplaceable in this context.

ICT makes it possible to make every process/task a learning activity; knowledge is continuously updated based on sensor networks and network infrastructure. ICT will allow better place for interaction between learners, between learners and social reality and between learners and a variety of information sources.

By 2020 learning will become a virtual networked action that will accompany people every day of their lives. Computer supported collaborative learning will play an increasingly important role in education. CSCL methods and tool will offer solutions to find new models and practices for facilitating creation and sharing of knowledge as well as dynamic development of expertise.

More personal devices that manage multimode delivery and interactions will replace present type of computers. For "mobile" workers flexible and habile multi-service devices, e.g. e-paper will be available. Mobile computers will become indispensable for teaching and learning. There will be completely different hard and software available: no keyboard, no mouse, no monitor.

Knowledge will increase rapidly during next decade. The huge amount of knowledge will then be managed by technology-supported means, e.g. CSCL. Organisational form will be blended learning.

With the help of technology all resources will be available to everyone. Education becomes a "made to measure" procedure that fits exactly on the need of an individual. Technology is changing the way we learn, since there are less time and more need for learning. Values should be reassessed. Education should find new ways of passing on cultural and moral values making technology to work for it not the other way round.

Learning in 2020 will be more oriented towards socialized skills and needs in work, e-learning methods for active people, with his/her own style and time. In the field of

universities the initial mission of teaching will change towards a more open, technological and specialized method. People will be able to choose among different ways and tools to learn: these will include more efficient virtual tools for an active learning like simulations on real time and passive tools like systems allowing people learn while sleeping or relaxing.

It will be possible for everybody to find his/her own possibilities to study through e-learning. An evaluation system will make it possible for each person to get information what is needed for a course in question. It will be natural to study together with people from different countries in the world by e-learning.

Technology will increase both the efficiency and the quality of education. Methods will have to change because people want to choose place and time for their education. This kind of flexibility can only be offered using new technologies. By 2020 there will be lots of new methodologies, new ICT, new software and hardware and everything will be considered as usual for everybody.

During next several years more complex hardware will be building a network. Then all interested people will have the possibility to make his/her own experience based on his/her own experiments. Old principles in education will come back together with new methods of presentation. Teaching will be a combination of e-learning and confrontation. Learning-books will be rare. Most knowledge will be provided by net and through periodicals on DVDs.

Some respondents pointed out that the influence of ICT is heavily overestimated. According to them classroom teaching and group work will continue to play an important role in a majority of studies. These activities will be mixed with eLearning scenarios. Every teacher will be completely aware of eLearning possibilities and can choose any form of classroom or eLearning scenario. Some studies will be performed exclusively through eLearning. Traditional universities will coexist with virtual universities. ELearning will develop offering more and more training and learning opportunities, but face-to-face learning and training will not be replaced to keep "warm" relationships between teachers and learners. eLearning should bring additional value to learning, while the class contact of teachers and trainees will remain vital for good education.

Personalization

44 new signals were dealing with personalization of education and training. Education and training will be more personalized. The emerging of non-standard forms of employment will require education and training to be more rapid to evolve and differentiate in order to give satisfactory answers to specific needs, in particular to match individual skills and competences with opportunities in the labour market, regardless of the kind of contract people have.

Learners will become more responsible for their own training. Training supply will be more diversified. From children to adults, people can choose their training with lot of variables. There will be multiple learning environments and multiple possibilities. Students will make more decisions and determine more the tasks they will complete

to achieve the outcomes or objectives of the system. Teachers' role will be to guide, facilitate, advice, challenge and intervene when and where they believe it is necessary or when students ask then to do so. Thus the role of the teacher will not be to read the described knowledge to students, but to teach the art of accessing and using knowledge in appropriate ways to be able to solve today's problems. It will be less teaching knowledge but teaching capabilities.

Education will be more self-directed. Academic education will be divided in two steps. At undergraduate level self-directed learning will be the main way to get basic knowledge and techniques. Postgraduate courses will give students the chance to specialize and develop their own personal ideas.

Learning will be assessed in terms of the out comes, what has been learnt, rather than how long a learner has been studying. It will be possible to achieve qualifications by demonstrating that you now and can do things without having to study in an institution for a number of years.

Individualism is a strong trend in our societies. Every person will have his/her own very individual learning career, a kind of patchwork-learning. By 2020 learning will be combinations of individualised tailor-made learning support learning within communities of practice and learning. In the future there will be more tools available, which allow individual training. Every learner has a possibility use a tool he or she likes the most. Tools will give visualization or explanations, which fit to the user's personal profile.

Less education takes place at traditional schools. Education will provide more (subject/profession) specific knowledge and competencies instead of general knowledge. Learners will be more heterogeneous groups of students/learners with different educational backgrounds and prior knowledge who only want focus on what they really need. The fundamental thing for the future is the readiness to adopt for new situations a kind of a learning ability that goes far beyond the traditional stages of learning (first level, secondary level, tertiary level).

Training will be provided on-line in order to meet individual needs. Education and learning will become more individual with the help of technique. However, with ever increasing options the learner will face the problem to choose where to invest his/her time.

Others

By 2020 we will have learnt more about learning. This means that learning will become more interesting and efficient. People become more able to see alternatives and to create them by themselves, i.e. more open to think otherwise. Decision-making may get difficult, but on the other hand, lead to better outcomes. The main problem in the future will be expertise, i.e. who can manage with a complex totality and how to keep up the civil society in a world in which knowledge is so differentiated.

By 2020 schools will still exists as social learning centres, but learning methods will change. Health and environmental issues will determine what people do for living.

Education will focus less on schoolbook knowledge, but more on social and communicative skills. In addition, education will start earlier in life and due to demographic ageing, periods of initial education will be shorter. There will be more interactions between theoretical and practical knowledge.

ANNEX 1
Number of respondents in the signals collection phase per country

Country	Respondents
Germany	61
Finland	33
United Kingdom	28
Hungary	19
Italy	18
Sweden	16
Norway	15
Austria	13
United States	13
Netherlands	12
Romania	11
Belgium	10
Spain	10
France	9
Denmark	8
Ireland	8
Switzerland	8
Canada	7
Slovenia	7
Bulgaria	6
Greece	6
Portugal	5
Australia	4
Estonia	4
Poland	4
Afghanistan	3
Brazil	3
Czech Republic	3
Iceland	3
India	3
Israel	3
Lithuania	3
Malta	3
Albania	2
Georgia	2
Latvia	2
Slovakia	2
Antarctica	1
Barbados	1
Botswana	1
Cocos (Keeling) Islands	1
Iran	1
Mexico	1
New Zealand	1
Nigeria	1
Pakistan	1
Paraguay	1
Serbia and Montenegro	1
Singapore	1
Turkey	1
Grand total	**380**

ANNEX 2
Number of respondents in the mapping phase per country.

Country	female	male	Respondents
Albania	1	2	3
Algeria	1		1
Australia	1	2	3
Austria	16	21	37
Belgium	1	8	9
Brazil	1	1	2
Bulgaria	1	1	2
Canada	1	3	4
Czech Republic		2	2
Denmark	2	4	6
Estonia	2		2
Finland	30	29	59
France	3	4	7
Georgia	1		1
Germany	20	40	60
Greece	6	6	12
Hungary	8	12	20
Iceland		2	2
India		1	1
Ireland	3	1	4
Israel		7	7
Italy	5	7	12
Japan		1	1
Netherlands	2	9	11
Norway	8	5	13
Pakistan		1	1
Poland	1	5	6
Portugal	19	12	31
Romania	7	8	15
Russia	1		1
Serbia and Montenegro	1		1
Slovakia	1	1	2
Slovenia	3	3	6
Spain	1	12	13
Sweden	9	8	17
Switzerland	4	2	6
United Kingdom	14	13	27
United States	6	9	15
Grand Total	**180**	**242**	**422**