Přínos využití automatizované obsahové analýzy ve foresightu

Benefits of Computer Based Content Analysis to Foresight

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Abstract:
Purpose of the article: The present manuscript summarizes benefits of the use of computer-based content analysis in a generation phase of foresight initiatives. Possible advantages, disadvantages and limitations of the content analysis for the foresight projects are discussed as well.
Methodology/methods: In order to specify the benefits and identify the limitations of the content analysis within the foresight, results of the generation phase of a particular foresight project performed without and subsequently with the use of computer based content analysis tool were compared by two proposed measurements.
Scientific aim: The generation phase of the foresight is the most demanding part in terms of analysis duration, costs and resources due to a significant amount of reviewed text. In addition, the conclusions of the foresight evaluation are dependent on personal views and perceptions of the foresight analysts as the evaluation is based merely on reading. The content analysis may partially or even fully replace the reading and provide an important benchmark.
Findings: The use of computer based content analysis tool significantly reduced time to conduct the foresight generation phase. The content analysis tool showed very similar results as compared to the evaluation performed by the standard reading. Only ten % of results were not revealed by the use of content analysis tool. On the other hand, several new topics were identified by means of content analysis tool that were missed by the reading.
Conclusions: The results of two measurements should be subjected to further testing within more foresight projects to validate them. The computer based content analysis tool provides valuable benchmark to the foresight analysts and partially substitute the reading. However, a complete replacement of the reading is not recommended, as deep understanding to weak signals interpretation is essential for the foresight.

Keywords: foresight, content analysis, horizon scanning, weak signal, foresight generation phase

JEL Classification: F01, F17

Introduction

Currently we encounter significant change of a business environment triggered by financial crisis in 2008, accompanied by falls of huge companies as Lehman Brothers inconceivable whenever in past. Present markets could be described as complex, unpredictable and volatile. World of growing interconnection and interdependence brings higher risk to all entities operating on markets. Turbulence is the new normality, punctuated by periodic and intermittent spurts of prosperity and downturn. There are two effects of turbulence, one is vulnerability, against which companies need defensive tools. The other is opportunity, which needs to be exploited (Caslione, Kotler, 2009).

Standard attitudes to strategy decision-making and planning based on forecasting of past development fail, as they were not adapted to uncertain and quickly changing market conditions. Therefore, we often face situations when companies are astonished by sudden change or turbulence affecting their core business and they only reactively respond to it by balancing of damaging effects. Management of uncertainty requires managers to adopt new ways and tools to support strategy decision-making process and monitor their business environment. (Carbonara, Caiazza, 2010). Without deeper understanding of future uncertainties, a company can miss many opportunities and grant its competitors a great chance to benefit from new technologies, innovations and business concepts etc. (Piirainen, Lindqvist, 2010).

Attempting to gain strategic advantage by spotting weak signals and connecting them to form emerging trends and new market developments is the latest view on strategy (Dasgupta, Sanyal, 2009). Corporate foresight represents one of the valuable supportive tools ensuring sufficient time for preparation of possible scenarios of future development and allowing managers to perform knowledgeable decisions based on weak signals evaluation. It seems to be very promissing solution to cope with the challenges of current markets as growing unpredictability and volatility. Design of optimal model of corporate foresight is subjected to the latest research (*e.g.* Rohrbeck, 2011) as well as use of modern technologies and IT tools to support foresight processes of a company.

1. Corporate foresight and horizon scanning

Foresight is based on principle that change does not occur suddenly; change is indicated by "weak signals" (Ansoff, 1975). Hence, the foresight is focused on process of gathering of information and views that may have some impact on future development. These "seeds of change" are obtained from wide range of disciplines and areas.

Many commonly used definitions of the foresight vary significantly based on focus of the foresight (strategic, technology, sector etc.). One of the most general states that, foresight is *„a systematic, participatory, future intelligence gathering and medium-to-long-term vision-building process aimed at present-day decisions and mobilizing joint actions*" (Miles and Keenan, 2002). Corporate foresight can be specifically defined as „*an ability that includes any structural or cultural element that enables the company to detect discontinuous change early, interpret the consequences for the company, and formulate effective responses to ensure the long-term survival and success of the company*" (Rohrbeck, 2011).

There are many benefits of corporate foresight implementation within company processes mentioned by scholars. Besides formal foresight outputs, also creation of relationships among involved stakeholders, discussion among foresight participants and initiation of specific actions based on foresight results are the most frequent positive side effects of an adoption of the foresight. On the other hand, foresight projects are considered as very demanding activities. High costs and involvement of many human resources are usual argument against wider use of the corporate foresight which can be seen as an expendable luxury (May, 2009) from this point of view.

Suitable IT infrastructure has potential to simplify the foresight process and significantly reduce costs. A range of technical tools can be applied in corporate foresight as customized application for collecting and sorting of weak signals, using of videoconferencing to get stakeholders together etc. Especially computer based tools performing content and context analysis receives more attention in relation to foresight process in last years.

Automated content analysis has got potential to simplify particularly a generation phase of foresight lifecycle when revision of existing knowledge concerning a theme of the foresight projects including weak signals is performed.

2. Generation phase of the foresight lifecycle

There are five well-documented phases when referring to the foresight lifecycle: (i) pre-foresight

(scoping); (ii) recruitment (participation); (iii) generation; (iv) action and evaluation; (v) renewal phases (Miles, Keenan, 2002; Popper, 2008; Georghiou et al., 2008; Nugroho, Saritas, 2009 etc.). Scholars agree that the generation stage is the most important in the foresight lifecycle. „Generation phase is considered to be the main phase of the process, given that this is where: (i) existing knowledge is amalgamated, analyzed and synthesized; (ii) tacit knowledge is codified, (iii) new knowledge is generated (*e.g.* elucidation of emerging and prospective issues); and (iv) new visions and images of the future are created (Popper et.al, 2010).

On the other hand the generation phase also represents the most challenging stage due to need to process big amount of data as many texts need to usually be processed and assessed in detail.

All foresight projects are unique, also particular methodology reflects the project specification. Several methods are recommended to generate required knowledge enabling formulation of defined foresight outputs (*e.g.* strategic recommendations, formulating of action plans, inputs for innovation process and policies etc.) in generation phase.

Literature review and horizon scanning are very good match as the methods complement each other. In addition, they provide very good results especially when combined with other knowledge gathering methods as Expert panels, Surveys, Science fictioning, Delphi or Patent analysis (Georghiou et al., 2008).

According to broad analysis of 886 cases of the foresight projects performed by Popper (2008), literature review is the most widely used method. Literature review is structured gathering and summarizing of information from defined sources. It provides an overview on actual development and key issues regarding a studied theme.

Horizon scanning method has been used in many foresight projects in recent years (*e.g.* FINPRO projects, iKnow project of European Commission etc.) and its popularity is growing. Horizon scanning can be defined as "*a structured and continuous activity aimed to monitor, analyze and position frontier issues that are relevant for policy, research and strategic agendas. The types of issues mapped by Horizon scanning include new/emerging: trends, policies, practices, stakeholders, services, products, technologies, behaviors, attitudes, "surprises" (wild cards) and "seeds of change" (weak signals)"* (Popper, 2011). The general steps being performed in generation phase of foresight initiatives based on horizon scanning are at least: (i) revision of gathered weak signals and eliminating of irrelevant weak signals, (ii) reading of all weak signals, identification of common attributes, (iii) clustering of the weak signals, (iv) assessment of the clusters, (v) interpretation, (vi) identification of trends and wild cards and creating of vision of the future development.

2.1 Key issues related to the generation phase

Data and information for the foresight generation phase are mainly gathered in form of textual documents, *e.g.* sector reports. Weak signals from horizon scanning are usually collected through IT tool in form of structured texts as well. For more extensive foresight projects the data set for evaluation might comprised of hundreds of documents (thousands of pages).

First of all, foresight analysts responsible for the evaluation needs to review very carefully all texts or documents identified as a source of information for the respective foresight initiative. The review procedure entails multiple reading of all documents (reports, weak signals etc.) which usually takes several days or weeks of reading. To avoid informational gaps caused by selective reading, at least two analysts should be separately involved in the reading and than evaluating.

Regarding elimination of irrelevant signals, there might be a different understanding of relevancy among the analysts. Therefore, only those weak signals that were eliminated by all analysts should be excluded from further processing. Identification of common attributes of weak signals based on which the clusters will be created is influenced by personnel point of view and perception of the analyst. The analysts might put emphasis on different attributes in line with their own knowledge and experience.

The most essential and at the same time the most demanding task of the generation phase is the interpretation when conclusions are drown. The interpretation of future trends, specification of wild cards and possible future developments determine creating of possible future scenarios. Nonetheless, interpretation is again based only on personal ideas, opinions and previous experience of analysts with the assessed topic. No standards can be applied. To minimize risk that one point of view prevails significantly and depreciates results of the whole foresight, stakeholders with diverse interests and opinions need to be involved in the generation phase. However, it requires the stakeholders to review all documents or at least extracts prepared by the foresight analysts. Only this precaution ensures necessary variety of views and proper challenging of created visions of future development along with "out of the box thinking". Unfortunately, proportional increase

of costs is associated to growing number of involved stakeholders.

Obviously, a method systematically processing the textual documents might positively affect the generation phase of the foresight in terms of costs and time reduction, meanwhile quality of the foresight outputs would be probably increased.

A content analysis seems to provide suitable solution for the generation phase of the foresight. On the other hand, there are several limitations concerning use of the content analysis within the foresight. They are primarily related to a fact that principal purpose of the foresight is to reveal sometimes hidden meanings and logical linkages. The article aims to verify suitability and expected benefits content analysis could provide to the foresight.

3. Content analysis

"*Content analysis is research method that uses a set of procedures to make valid inferences from text*" (Weber, 1990). Definition that is more recent refers to quantitative nature of the technique. "*Content analysis may be briefly defined as the systematic, objective, quantitative analysis of message characteristics*" (Neuendorf, 2002). Primarily the content analysis determines a presence of words or phrases in selected texts.

Actually, there are several analytical software tools able to conduct the content either context analysis available on the market. Computer based content analysis software performs usually automatic full-text searches, identifies keywords based on frequency of occurrence, allows automatic sorting of words into clusters and creation of visual concept maps. Furthermore, it usually can perform comparison of texts, automatically sort texts into clusters, extract logically linked themes, and provide word metrics for other analysis etc. In general, content analysis consists of several consequent steps, starting with selecting content for the analysis, creating units of content, coding or indexing the content, counting, assigning a weighting and drawing conclusions.

Perhaps, the most distinctive characteristic that differentiates content analysis from other, more qualitative or interpretative message analyses is the attempt to meet the standards of the scientific method (Neuendorf, 2002).

The content analysis might have a potential to reduce risks and issues associated to the foresight generation phase as it might decrease costs and duration of the phase. On the other hand, limitations, distortion and other negative impacts content analysis might have on the results of the foresight evaluation phase must be assessed as well. Pros and cons of use of the content analysis should be verified as well as conditions under which the method might be applied in real foresight projects.

4. Methodology of testing of content analysis in a foresight project

This article aims to verify potential benefits of use of an automated computer based content analysis software in the foresight. In order to prove the benefits, a testing was performed on the set of textual documents (reports and weak signals) used in the generation phase of real finished foresight project, which had been carried out originally without use of any content analysis tool. Identical set of analyzed textual documents was processed with computer based content analysis tool to ensure consistency of results.

Product of Tovek s.r.o. company – Tovek tools was used for conducting the content analysis. Tovek Tools is a set of client desktop applications designed for data indexing, information searching, various types of analysis and the creating of summaries. They are suitable for working with large amounts of text data from various informational sources (www.tovek.com, 2012).

Two indicators were chosen to assess potential improvements that might result from use of content analysis in the generation phase of a foresight. The first was duration of the evaluation of the set of the documents. Actually, duration of the foresight generation phase carried out by multiple reading and consequently with use of Tovek tools were compared. The duration was measured in standard ManDays, one ManDay lasted 8 working hours. Time slots dedicated to the foresight evaluation tasks were registered in timesheets of allocated foresight analysts.

Some stages of the generation phase were necessary to perform for both compared evaluation procedures. E.g. the first stage of evaluation when all the content documents (weak signals, reports) were quickly assessed and irrelevant weak signals or reports excluded. As they are not subject of the comparison such tasks are not further discussed in detail, nonetheless it definitely belongs within the generation phase. Such stages are only mentioned in the Table 1 where the compared durations of specific evaluation tasks are indicated.

The second measure was level of compliance between results (clusters and sub-clusters) produced in foresight evaluation phases carried out by multiple reading and consequently with computer based

content analysis tool. The level of compliance was expressed as a percentage of identical sub-clusters identified by the multiple reading and the content analysis based on their descriptions.

The limitations of the content analysis for the foresight are discussed along with the final evaluation of two above mentioned measurements.

4.1 Overview of the foresight project and specification of data for the testing

The foresight project was launched based on requirements of Czech company operating in metal processing industry. One of key business activities of the company is supplying big automotive producers as Volkswagen, Audi etc. Electric mobility is an important topic in the automotive industry as it has potential to significantly shape the whole segment once the electric vehicles becomes a „mainstream".

Future prospective of electric mobility can be considered fuzzy due to high number of unpredictable factors determining it. A provision of key information and scenarios of future development which should support strategy decision-making process of the company was a main purpose of the project. The project aimed to identify key factors affecting mass adoption of electric vehicles by consumers *e.g.* drivers, barriers, demand, environment etc. Secondly, the project was expected to provide three scenarios of possible future development of electric mobility worldwide with focus on Europe.

The foresight project had been managed in standard way without use of any automated IT tool in evaluation phase and it had been closed before the content analysis was started. Any interference of results of content analysis and conclusions obtained by the multiple reading can be therefore excluded.

Horizon scanning approach was combined with Literature review dealing with electric vehicles prognosis. 100 signals were collected from 14 countries by resources located in respective countries. 17 key publications and reports about electric mobility were identified for further processing (research performed by the foresight analysts). 34 signals had to be excluded from the final evaluation mainly due to an incomprehensiveness or irrelevancy to studied topic.

As the dataset used for the testing were used above mentioned publications (pdf files) and weak signals converted to word files, aggregate of 83 files, altogether 538 pages of texts.

4.2 The generation phase performed by the multiple reading

First of all, the documents defined as the dataset were studied by two foresight analysts. It took 3.5 ManDays to each analyst to complete the multiple reading. Consequently, both analysts identified key topics – clusters with sub-clusters separately. Identification and approval of final set of clusters did not exceed 0.25 ManDay.

All documents from the analyzed set were than assigned to the clusters and sub-clusters. Each document could be possibly assigned to more clusters or sub-clusters according to logical linkage justified by the foresight analysts. Important and interesting passages of the texts were selected from the documents. A description of the clusters was formulated based on these selected passages. This stage did not require detailed reading again as analysts marked interesting parts of the content documents , it took approximately 1.5 ManDay and only one foresight analyst was allocated.

Total duration of evaluation phase carried out by multiple reading was 9 Man-Days, two foresight analysts were involved.

7 clusters with 21 sub-clusters were provided by the foresight analysts as the result of the generation phase, they are listed in a Table 2.

4.3 The generation phase carried out with use of Tovek tools

Analysis of the content documents proceeded in several steps determined by the software: (i) indexing (ii) automated content analysis (illustrated as a map of topics), (iii) definition of relevant queries, (iv) context analysis (definition of clusters and identification of related texts), (v) assessment of the clusters. Four modules of Tovek tools were used for the study: (i) Index Manager; (ii) Tovek Agent; (iii) InfoRating; (iv) Harvester.

Index Manager provides manual or automated indexing of textual documents in several formats (word, pdf, etc.). Indexing via Index Manager application is a required step, as by the indexing are provided new or updated full-text sources that allow the user find informationby a single query from one place. (Tovek, 2012)

Other application, Tovek Agent, enables searching of indexed documents in connected information sources (using queries, displaying of relevant result lists, content analysis etc). Tovek Agent also provides advanced functions *e.g.* automatic clustering of indexed documents according to common content or sorting of documents by a relevance to the query and many others.

Set of documents for the indexing was prepared simply. One word document containing full weak signal description was prepared for every weak signal. Selected reports were left in the format they

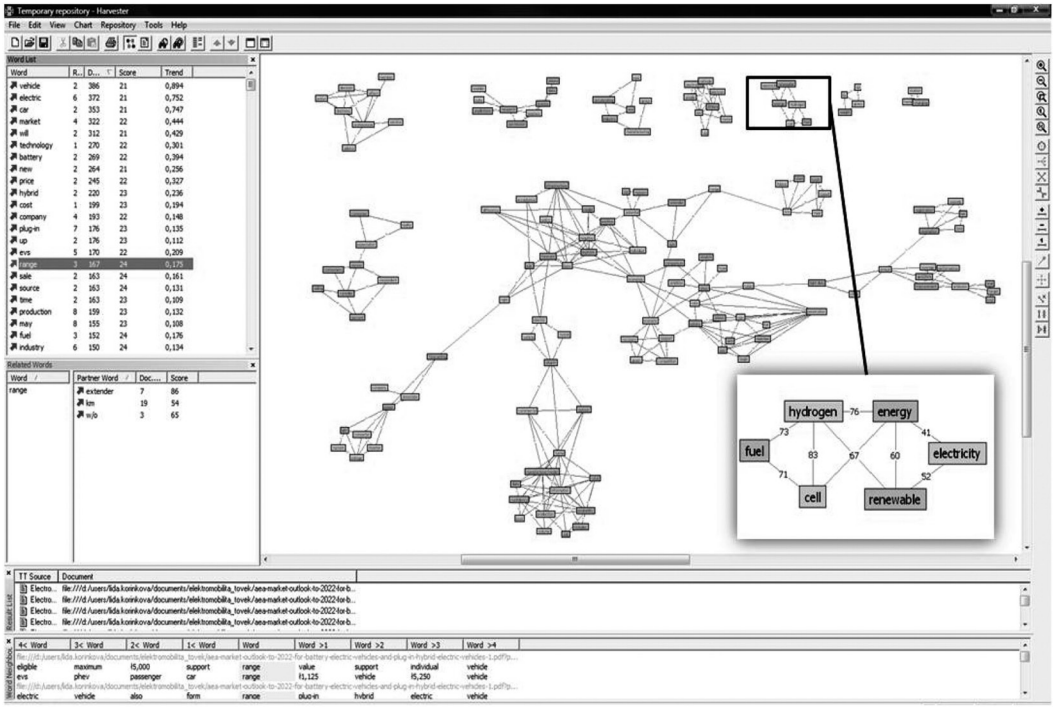

Figure 1. Map of key words resulted from the content analysis. Source: Own work with Tovek tools software, application Harvester.

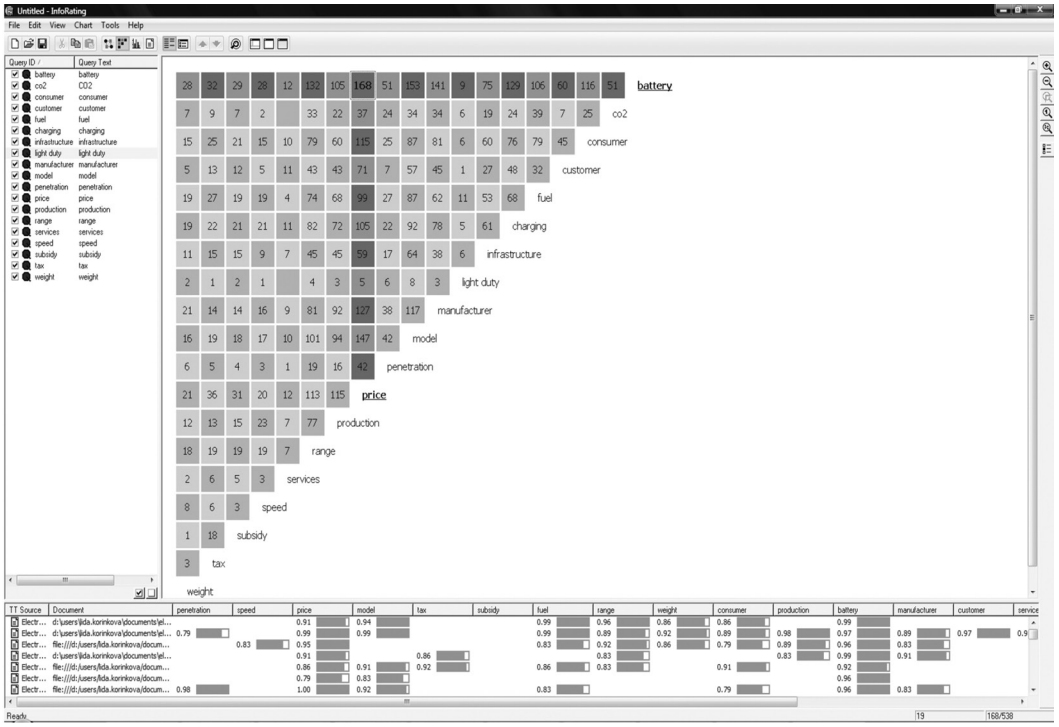

Figure 2. An example of a cross matrix – an output of the context analysis. Source: Own work with Tovek tools software, application InfoRating.

were originally (pdf). The software performed the indexing of prepared 83 documents (66 weak signals, 17 reports) automatically. Tovek tools further does not work with the whole documents but only with separate pages (538 pages altogether) associated in one source file (Electric mobility). Nonetheless, it is easy to identify source document for every page if needed due to indexing (index includes name of the original document and page number).The content analysis was performed on all the pages of the set of documents selected by Tovek Agent (specifically empty query ensures selection of all the pages) and application Tovek Harvester was triggered afterwards. Tovek Harvester is a tool that provides content analysis of unstructured texts in order to automatically determine the key topics. (Tovek, 2012)Output of the content analysis is graphical map of key topics (Figure 1). In general, the content analysis is conducted based on an algorithm assessing pairs and triads of words. Word order and construction of sentences are being considered as well. Manual editing of the map is important to eliminate often words not related to the theme (*e.g.* names of authors listed in the header of a document on each page). Duration of this task did not exceed 0.25 ManDay and only one foresight analysts was involved.

Conglomerations of displayed words were drafted from the map and verify in detail by available statistics: (i) a relative pair count; (ii) count of pages where the word occurs; (iii) score of a word and (iv) a trend, only the first two statistics were used. A relative pair count was highest in a case of words "power" (16), "manufacturer/model" (12), "emission, retail, availability, negative, euphoric, hydrogen and infrastructure" (10). The highest count of pages where it occurs was indicated for the words "vehicle" (386), "electric" (372), "battery" (269), "price" (245), "range" (167), "sale" (163) etc. The words with occurrence higher than 100 were further examined.

The software also showed the words with which are the most frequently created pairs and words often presented in a vicinity of the examined word. Key words (the most frequent words and words creating the highest number of pairs, also important pair words) were listed for the following context analysis. Proceeding of this step took approximately 0.5 ManDay of one foresight analyst.

After detailed content analysis was finished, a context analysis was conducted via InfoRating

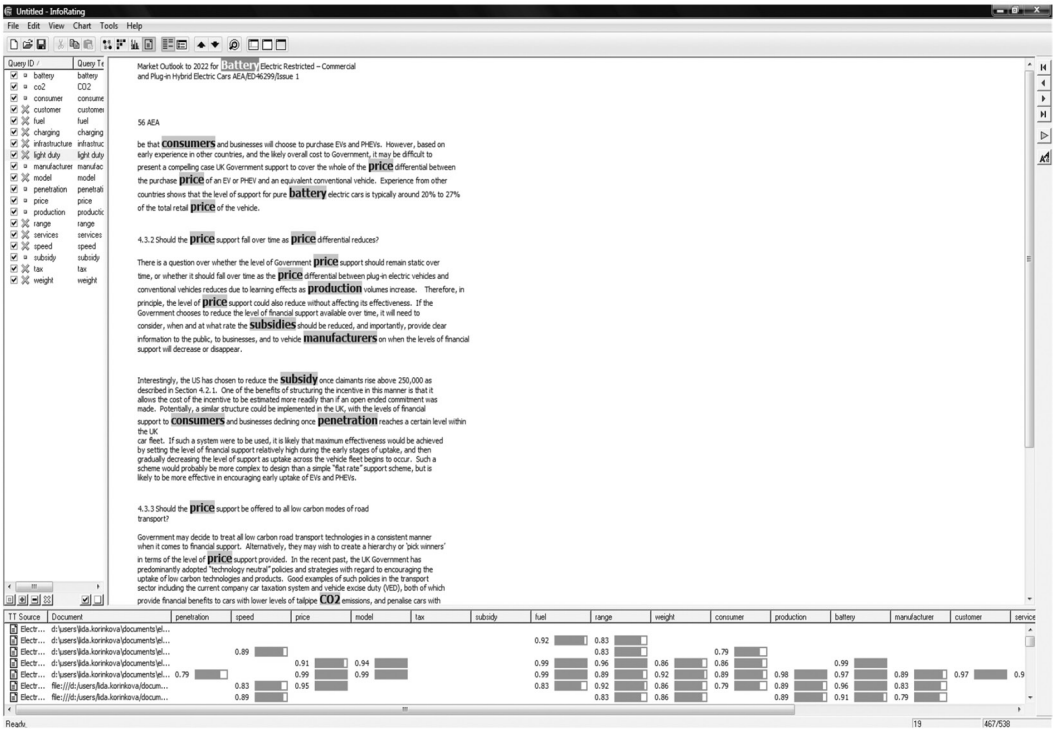

Figure 3. An example of a cross matrix – an output of the context analysis. Source: Own work with Tovek tools software, application InfoRating.

application. InfoRating is a tool that finds and displays relations between content of analyzed documents and defined queries. Only basic queries for the context analysis were used, as every key word represented one query. Queries were simple key words without any conditions. An output of InfoRating was displayed as a cross matrix of key words (for an example of the cross matrix please see Figure 2). Some key words were finally excluded of the list, *e.g.* "inverter, converter", because such words did not prove co-occurrence with any other key words and after verification of the source texts it was confirmed that they were not relevant to the main theme.

Actually, more complicated queries could have been used in order to validate conclusions in the interpretation stage of the evaluation phase. It was not necessary in this specific case as the texts were quite consistent and the volume of the processed textual document was not high. Duration of the context analysis was 0.5 ManDay of one foresight analyst.

When the context analysis had been finished passages related of the key words were gathered to form clusters, sub-clusters and their descriptions. Tovek tools can display pages where selected key words occurred directly in InfoRating application.

All pages where the selected key word occurred were displayed in a bottom window of a screen. Other key words presented on the same page were indicated too. A selection of the page switch the screen from the cross matrix to a text of the page. All key words included in the context analysis are automatically highlighted which significantly simplify the reading as well as the selection of related passages of the text which would form descriptions of final clusters.

The foresight analyst could quickly skip pages where the key word was only mentioned without any additional information (Figure 3). On contrary, the foresight analyst was able to compile important facts concerning the clusters and sub-clusters fastly without an option of missing any information. Selection of the passages needed for description of the clusters did not exceed 1 ManDay of one foresight analysts.

5. Summary of the results and discussion

5.1 Evaluation of the durations

Evaluation of the first measure – comparison of duration of evaluation phase conducted by multiple reading and evaluation phase conducted with use of computer based content analysis tool is summarized in Table 1. The results indicate significantly shorter time consumed by evaluation when the content analysis tool has been used. This is mainly due to skipping of the multiple reading of all documents in the dataset which need to be otherwise executed by two human resources.

The reading is definitely simplified with use of the content analysis tool especially if only one foresight analyst can be assigned. On the other hand, very strong arguments can be raised in favor of the reading of the whole set of documents by two independent analysts. As the analytical software works with most frequent words, some messages from weak signals might be missed and the foresight would have lost its added value.

The foresight analysts should be also aware of important information present in the content to be able

Table 1. Comparison of durations of evaluation phase of foresight lifecycle without and with use of content analysis tool.

Task performed in evaluation phase	Duration of evaluation phase – multiple reading (ManDays)	Duration of evaluation phase – use of content analysis tool (ManDays)
Revision of gathered signals and elimination of irrelevant signals or reports	0.5	
Reading of all content documents, identification of common attributes	7	0
Clustering of the weak signals and reports	0.5	1.25
Assessment of the clusters, identification of related passages	1.5	1
Interpretation	1	
Identification of trends and wild cards and creating of scenarios	2	
Duration of evaluation phase	**12.5**	**5.75**

Source: Own work.

Note: Duration of two tasks – reading of all content documents and clustering of signals need to be performed by two foresight analysts in evaluation without use of content analysis tool, durations are therefore doubled.

to draw valuable justified conclusions and interpret possible visions of the future developments. General overview of the topic is a must for the foresight. Of course the content analysis tool does not prevent the foresight analyst from reading, more over it is inevitable when the description of clusters and sub--clusters are prepared. The initial indexing provides the analyst with information which documents and weak signals are relevant to which cluster and attention should be paid to them. Though, the analysts on contrary do not need to waste time with the "data smog", redundant information not relevant to the foresight.

A problem with use of content analysis tool might emerge when the analyst conducting the analysis has got no awareness of the examined theme. Elimination of any key word without previous careful verification of original texts from the map would be inappropriate in such case. Eventually the analyst might finally reach the same results but in longer time.

5.2 Evaluation of the level of compliance

The second measure – level of compliance among the results of evaluations performed by multiple reading and with use of the content analysis tool provides clear reflection on a suitability of the tool for the foresight initiatives.

The clusters and sub-clusters can be reviewed in a Table 2. There were 21 sub-clusters identified by the foresight analysts via reading. 19 were matched by sub-clusters identified via Tovek tools. Final percentage of matched sub-clusters based on their descriptions is 90.5%.

Two sub-clusters were missed when the content documents had been analyzed via Tovek tools – "safety and unrealistic plans". It was mainly caused by

Table 2. Comparison of clusters and sub-clusters drawn without and with use of content analysis tool.

Clusters and sub-clusters identified without use of content analysis tool		Clusters and sub-clusters identified with use of content analysis tool
Cluster	**Sub-cluster**	**Sub-cluster**
Price	Total costs of ownership	Price
	Battery price	Price / battery
	Price of fuel	Fuel
Technology maturity	Range and speed	Range / speed / weight
	Charging time	Charging / infrastructure
	Charging endurance	Battery / weight
	Safety	0
	R&D investments	Production / model / manufacturer
Cities and urbanization	Emissions and noise	CO2
	Reduction of cars	Tax / subsidy
	Current consumers	Profile
	Subsidies	Tax / subsidies
Political demand	Emissions/greenhouse gases	CO2
	Unrealistic plans	0
Customer	Profile	Customer/consumer
	Acceptance	Penetration, acceptance, expectations vs. reality
	Future markets	Production / model / manufacturer
Infrastructure	Dynamic development	Charging stations
	New business models	Services
Product outlook	Production	Production / model / manufacturer
	New models	Production / model / manufacturer
	0	Light duty

Source: Own work.

Note: Different names of sub-clusters were chosen as the clustering was performed separately in both cases. Sub-clusters identified by multiple reading and via content analysis were paired according to their descriptions.

low occurrence of these themes within content documents. *E.g.* safety issues related to electric cars was mentioned only in 3 weak signals but it was given a high priority by the foresight analysts as it can have a considerable impact on the industry. On the other hand, sub-cluster „light duty" was completely missed by the foresight analysts but it was clearly an important sub-cluster as the occurrence was quite high. After revision of this phrase, the foresight analysts concluded it should be included in the set of the sub-clusters as well.

The completeness of the descriptions of the sub--clusters was finally compared as well. The descriptions received via Tovek tools were more extensive apparently, as all texts related to the sub-cluster were taken into account.

Conclusion

The computer based content analysis tool was tested in order to verify benefit content analysis might have for the foresight. Two measurements were proposed for the verification. Both measurements proved the content analysis affects positively the foresight generation phase in terms of considerable reduction of time and better comprehensiveness of the description of the clusters and sub-clusters.

Based on findings the content analysis can be definitely recommended as a supportive tool for the foresight analysts in conducting the foresight evaluation phase. The content analysis primarily provides valuable benchmark so one foresight analyst can be omitted from the evaluation and therefore costs would be reduced. On the other hand, limitations of the content analysis are considerable as the method works with statistical evaluating of occurrence of words and phrases. Important rare topics (*e.g.* wild cards) might be missed which can negatively influence the whole foresight.

Therefore, the content analysis should be applied to more foresight projects to determine a balance between simplification provided by this method and level of acceptable completeness of information obtained from the dataset. Further examination should focus mainly on different processing of the informational sources as the weak signals are considered the possible seed of future changes, but the sector reports should deliver the context to complement them. Content analysis can be fully applied on the reports and the foresight analysts might fully concentrate on the weak signals only.

References

Ansoff, H. I. (1975). *Managing Surprise and Discontinuity: Strategic Response to Weak Signals*. European Institute for Advanced Studies in Management.

Carbonara, G., Caiazza, R. (2010). How to turn crisis into opportunity: Perception and reaction to high level of uncertainty in banking industry. *The Journal of Futures Studies, Strategic Thinking and Polic*, pp. 37–46.

Caslione, J. A.; Kotler, P.. (2009). *Chaotika: Řízení a marketing firmy v éře turbulencí.* BIZBOOKS, Praha.

Dasgupta, S., Sanyal, D. (2009). Bridge to the future: Connect your strategies in an interconnected world. *The Journal of Futures Studies, Strategic Thinking and Policy*, pp. 81–93.

Georghiou, L., Harper, J. C., Keenan, M., Miles, I., Popper, R. (2008). *The Handbook of Technology Foresight: Concepts and Practice.* Edward Elgar Publishing Limited, Cheltenham.

May, G. (2009). Foresight and futures in europe: An overview. *The Journal of Futures Studies, Strategic Thinking and Policy*, pp. 57–67.

Miles, I. D., Keenan, M. P. (2002). *Practical Guide to Regional Foresight in the United Kingdom.* European Commission, Brussels.

Neuendorf, K. A. (2002). *The Content Analysis Guidebook.* Sage Publications, Inc., Thousand Oaks.

OECD. (2011). *Government at a Glance 2011.* [online] [cit. April 19th 2012], Retrieved from: http://www.oecd.org/document/33/0,3746,en_2649_33735_43714657_1_1_1_1,00.html.

Nugroho, Y., Saritas, O. (2009). Incorporating network perspectives in foresight: A methodological proposal. *The Journal of Futures Studies, Strategic Thinking and Policy*, pp. 21–41.

Piirainen, K., Lindqvist, A. (2010). Enhancing business and technology foresight with electronically mediated scenario process. *The Journal of Futures Studies, Strategic Thinking and Policy*, pp. 16–37.

Popper, R. (2008). How are foresight methods selected? *The Journal of Futures Studies, Strategic Thinking and Policy*, pp. 62–89.

Popper, R., Georghiou, L., Keenan, M., Miles, I. (2010). *Evaluating Foresight.* Univesidad del Valle (Colombia), Santiago de Cali.

Popper, R. (2011). *New Horizon Scanning Concepts, Practices and Systems.* [online] [cit. January 18th 2012], Retrieved from: http://community.iknowfutures.eu/pg/file/popper/view/12170/new-horizon-scanning-concepts-practices-and-systems.

Rohrbeck, R. (2011). *Corporate Foresight: Towards a Maturity Model for the Future Orientation of a Firm.* Springer-Verlag Berlin Heidelberg, Berlin.

Tovek. (2012). *Tovek s.r.o.* [online] [cit. April 24th 2012], Retrieved from: www.tovek.com.

Weber, R. P. (1990). *Basic Content Analysis.* Sage Publications, Inc., Newbury Park.

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