The Dutch-Flemish comprehensive approach to HLT stimulation and innovation: STEVIN, HLT Agency and beyond

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Abstract

This paper shows how a research and industry stimulation programme on human language technologies (HLT) for Dutch can be "enhanced" with more specific innovation policy aspects to support the take-up by the HLT industry in the Netherlands and Flanders. Important to note is the distinction between the HLT programme itself (called STEVIN) with its specific related committees and actions and the overall policy instruments (HLT Agency, HLT steering board, …) that try to span the entire domain of HLT for Dutch and have a more permanent character. The establishment of a pricing committee and a PR & communication working group is explained as a consequence of adopting the notion of "innovation system" as a theoretical framework. It means that a stronger emphasis is put on improving knowledge transfer and exchange amongst actors in the field. Therefore, the focus at the programme management level is shifting from the projects' research activities producing results to gathering the results, making them available at a certain cost and advertising them through the appropriate channels to the appropriate potential customers. Our conclusion is that this policy stimulates the transfer from academia to industry though it is too soon for an in-depth assessment of the STEVIN programme and other HLT innovation policy instruments.

1. Introduction and Background

Structural collaboration between Flanders (Belgium) and the Netherlands in matters concerning the Dutch language dates back to 1980. At that point the Dutch and Belgian[1] governments signed a treaty to cooperate in promoting the Dutch language and created the Dutch Language Union (Nederlandse Taalunie - NTU). Strengthening the position of the Dutch Language is one of its core responsibilities. Consequently, in the last decade, the NTU has taken a serious interest in digital language resources and human language technologies (HLT), because they are crucial for a language to be able to survive in the information society. Spurred on by the NTU the Dutch and Flemish governments decided in 1999 to collaborate on HLT for Dutch and set up an HLT Platform, which later became the HLT steering board (TST-bestuur)[2]. The HLT Platform set up a number of activities (see Beeken et al. 2000, Binnenpoorte et al. 2002a) which eventually resulted in a comprehensive stimulation programme for HLT for the Dutch language (Cucchiarini and D'Halleweyn 2004).

This joint HLT programme is comprehensive in many respects. First of all, because it is based on co-operation between government, academia and industry (see Figure 1) both in Flanders and in the Netherlands (in innovation terminology, this could be called a "double triple helix"). Co-operating saves money and effort, boosts the status of the language and means not having to reinvent the wheel over and over again. Secondly the programme encompasses the whole range from basic resources to applications for language users. Thirdly, it concerns the whole cycle from language resource (LR) development to LR distribution

In previous publications we have described various stages in the preparation of this programme, (Cucchiarini et al. 2002), the specific choices that were made with respect to management, maintenance and distribution of LRs: *HLT Agency*, (Boekestein et al. 2006), the *HLT info desk*, and the research and industry stimulation efforts in the framework of the *STEVIN*[3] *programme* (D'Halleweyn et al. 2006).

This paper will focus on how this comprehensive programme was "enhanced" with specific innovation policy aspects to support the take-up by the HLT industry in the Netherlands and Flanders. We will briefly describe the STEVIN programme (section 2.2), its context (section

[1] As a consequence of the Belgian state reform (federalisation), Flanders became the official partner of the treaty.

[2] It is a coordinated effort of the Dutch Ministry of Economic Affairs, SenterNovem (the innovation agency of the Dutch Ministry of Economic Affairs), the Dutch Organisation for Scientific Research (NWO), the Dutch Ministry of Education, Culture and Science, the department of Economy, Science and Innovation (EWI) of the Flemish government, the Institute for the Promotion of Innovation by Science and Technology in Flanders (IWT-Vlaanderen), and the Flemish Fund for Scientific Research (FWO-Vlaanderen). The NTU, as an intergovernmental organisation, coordinates the endeavour. The HLT steering board (TST-bestuur) supervises the STEVIN programme, the HLT Agency (TST-centrale) and the HLT info desk ("makel en schakel") – see Figure 1.

[3] STEVIN is a Dutch acronym of Spraak- en Taaltechnologische Essentiële Voorzieningen In het Nederlands which stands for 'Essential Speech and Language Technology Resources'. In addition, Simon Stevin is a 16th century applied scientist that worked on, amongst other things, introducing Dutch terms for mathematical and physical concepts. He has worked both in Flanders and the Netherlands. Consequently, his name is a perfect acronym for this programme.

2.1) and background (section 2.3). In section 3 we will discuss the specific actions and the overall policy instruments that try to span the entire domain of HLT for Dutch and that have a more permanent character. With the "innovation system" as a theoretical framework, a stronger emphasis is put on improving knowledge transfer and exchange amongst actors in the field. The focus is not only on the research projects producing results, but also on making available (section 3.1) and promoting these results (section 3.2) through the appropriate channels to the appropriate potential customers. Before presenting some conclusions (section 5), an outlook is provided on the preparations of a follow-up programme (section 4).

2. Innovation policy aspects

2.1 A theoretical framework

It is a truism to state that fundamental research is crucial for innovation. However, the presumption that if enough money is spent on research, the results will eventually find their way into innovative products or services is naïve and reflects the old linear model of innovation. The innovation gap remains a European problem: the take-up of good research results by industry and their integration in products and services is obviously hindered.

In the field of HLT especially smaller languages, like Dutch, encounter an additional problem. Some basic linguistic resources, necessary building blocks for applications, are too costly to be profitably developed by one (or more) private enterprise(s). As a consequence, the HLT for Dutch industrial sector is still rather modest. Additionally, the HLT market for Dutch remains limited as integrators and customers are unaware of the potentialities and qualities of HLT for Dutch [4]. Economists refer to such a phenomenon with the term *market failure*. It is not uncommon that if the market fails to invest, the government steps in (with extra money or by taking other – e.g. tax – measures).

To cope with the market failure in the Dutch speaking area, the Flemish and Dutch governments decided to fund a common research and industry stimulation programme called STEVIN worth of 11.4 M €. To ensure that the project results would find their way to users (s.a. integrators), thus addressing the innovation gap, it was decided that the NTU would become the owner of the STEVIN results. This moreover guarantees long term responsibility and reliability for management maintenance.

As the NTU is a policy organisation, it set up a dedicated organisation, the HLT Agency[5], in order to organise easy access and re-usage of LRs (e.g., see Maks et al. 2008). The HLT Agency, acting as "the one-stop-shop for HLT for Dutch", manages, maintains and distributes STEVIN results.

Innovation is the result of many players interacting with each other (companies, universities, governments and their agencies, …) without a central controlling mechanism. Actions of individual actors can spur (never ending) chain reactions in the entire *innovation system*. The role of the government is to reinforce the links and collaboration between all these actors, for example by giving financial support, creating or abolishing laws, or acting as a ('launching') customer.

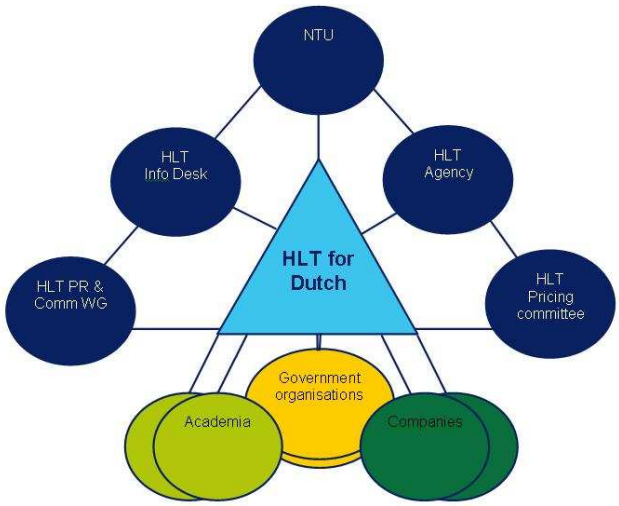

Figure 1: The most important ***HLT for Dutch*** committees

In line with this concept of innovation as a system, an emphasis on structural information dissemination between the various actors is needed. Again, to guarantee long term stability and neutrality (and hence general acceptance) of this effort, an info desk, located at the NTU, was set up. One of its primary tasks is to continuously survey the field and maintain an up to date overview of HLT for Dutch actors. The HLT info desk maintains an HLT website [6] (including an activity agenda and the overview of actors in the field), publishes monthly a newsletter, supports awareness raising activities etc. On average, in 2007 the website received 200 visitors per day. Not surprisingly around 90% of the visitors are located in the Netherlands and Belgium. Over time, the newsletter and activity agenda have succeeded in achieving credibility in the field as qualitative points of reference.

2.2 Stimulating innovation in the HLT for Dutch domain

The aim of the seven-year programme STEVIN is to contribute to the further progress of HLT for the Dutch language, by (1) promoting strategic research in HLT and developing HLT resources that are essential and are known to be missing, and (2) raising awareness of HLT results and stimulating the demand of HLT products, (3)

[4] The market in Flanders is different from the one in the Netherlands. The latter has quite some local spin-off and SME companies, while the former is dominated by a few subsidiaries of international players next to many micro-companies.

[5] http://www.tst.inl.nl/index_en.php

[6] http://taalunieversum.org/taal/technologie/ (website in Dutch)

organizing the management, maintenance and distribution of HLT resources once they are developed. The STEVIN activities run from 2005 till 2011.

Content-wise STEVIN is managed (see Figure 2) by a scientific programme committee (PC) consisting of Dutch and Flemish HLT experts from academia and industry complemented by an international HLT advisory panel (IAP) and supported by a programme office (PO). The programme is supervised by the HLT steering board (board). The Dutch Language Union (NTU) functions as the overall coordinator.

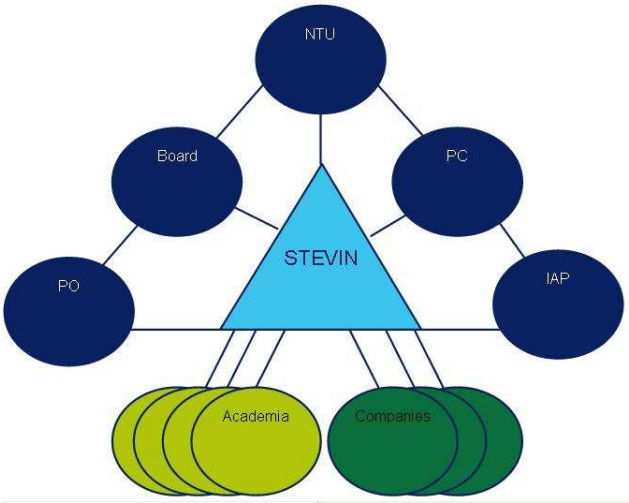

Figure 2: The most important ***STEVIN*** committees

Strategic research and resource development are addressed in R&D projects, which are briefly described in section 2.2.1 Raising awareness of HLT results and stimulating the demand of HLT products is partly pursued through demonstration projects (section 2.2.2.) and other initiatives such as the calls for networking and educational activities, which are dealt with in section 2.2.3. The HLT Agency organises the management, maintenance and distribution of HLT resources once they are developed (Boekestein et al. 2006).

2.2.1 STEVIN R&D projects

In the STEVIN programme a stratified view on innovation in the HLT field has been adopted. The following layers are addressed: (i) a basic resources level (dictionaries, corpora, language models, …), (ii) a generic technology level (parser, tagger, TTS-engine, ASR-engine, …), (iii) an integration layer (question and answer applications, …). A fourth level, an end-user level (off the shelf products or services) is not targeted by the STEVIN programme. Several calls were launched under the STEVIN programme: three open calls and two tenders. The tenders targeted specific priorities (speech recogniser for Dutch, a lexical database, a corpus of written Dutch). The proposals for the open calls had to address elements of the predefined BLARK (Basic Language Resources Kit) for Dutch.

In assessing the proposals the different innovation levels were taken into account. The first two open calls and the tender calls explicitly targeted the basic resources and generic technology levels, while the third open call solicited application projects. As cooperation with industry is encouraged, consortia of both academic and industrial partners were welcomed.

In all, 19 R&D projects were elected for funding for a total amount of approximately 7.82 M €. Projects of the first two calls have already been presented at LREC (D'Halleweyn et al. 2006). Five projects have been selected for the third open call and one for the second call for tender. The latter (SoNaR) lays the ground works for a large written corpus for Dutch. Accepted proposals of the open call concern a hybrid machine translation system that combines corpus and rule based algorithms (PaCo-MT), grapheme-to-phoneme converters for place names and other points of interest (Autonomata TOO), an ASR-based system for training oral proficiency in Dutch as a second language (DISCO), a set of Dutch language resources and tools for identifying and aggregating sentiments in online data sources (DuOMAn), and new summarisation techniques for Dutch texts (DAISY).[7]

2.2.2 STEVIN demonstration projects

In order to stimulate the demand of HLT applications, a substantial budget line is allocated for 'accompanying measures'. The most important measure being demonstration projects. Three calls for demonstration projects, in total worth of 1 M €, explicitly aimed at integrating readily available HLT for Dutch technology into real life applications with a high potential for exposure and visibility. Demonstration projects are short term projects (maximum 1,5 year) of maximum 100K € involving at least one SME. They are led by an industrial partner and preferentially involve real users. The resulting software remains the property of the contracting partners. Dissemination and validation plans are required. There is no room for research: proven technology should be used to demonstrate that HLT for Dutch can be integrated in real life applications and can add value, lead to cost cuts or better professional working conditions for humans. A first round of three demonstration projects has delivered end results. A second batch of six demonstration projects is more or less half way. A third and final round of five projects has recently taken off.

A nice example of a demonstration project is the number retrieval tool built for the Dutch police force ("SNRT" project). It allows police officers "on the road" to check registration plates of vehicles in a hands-free manner. In addition, in the police control room fewer people are needed to manage this type of calls and requests. More time can be devoted to "interesting" tasks. Other examples are a spell check chatbot (SpellCheat project[8]), and a tool to avoid administrative and complicated language in documents and written customer interaction

[7] http://www.stevin-tst.org/projecten/
[8] www.spelspiek.nl (website in Dutch)

("Sound Language" project[9]). A telephony-based tool to recruit call centre employees (VoiceAssess project) is used to make an initial selection amongst the applicants. A Flemish newspaper editor that offers a special edition for visually disabled persons (the talking news paper project) wants to set up a speedy production process using speech technology to create CDs (using the DAISY standard) containing a spoken newspaper (Audio Paper project). The Dutch and Flemish public broadcasting companies are integrating speech recognition and text alignment techniques to semi-automatically produce Dutch subtitles (NeON project).

All industry partners involved are positive about these projects. The STEVIN demonstration projects allowed them to approach new customers, to extend existing products or services with more functionalities, thus offering more value to the customer. The number retrieval tool is an excellent example for the success of the demonstration projects. Originally built for the local police force of the city of Utrecht, the tool has eventually been deployed on a nation-wide level.

The tight collaboration between academia and industry strengthens bidirectional knowledge exchanges. All in all, this part of the STEVIN programme can already now be considered a success. In a future STEVIN II programme, this of type of calls should be extended to allow the funding of a higher number of demonstration projects.

2.2.3 STEVIN funding for networking and educational activities

Recognising the systemic aspects of innovation includes supporting all kinds of actions and activities that stimulate new collaborations and knowledge transfer. Such activities range from extending the expertise of individuals to matching organisations with suited partners. That is why a specific part of the STEVIN budget has been foreseen to sponsor all kinds of networking activities (mainly conferences, workshops and brokerage events) open also for organisations that otherwise would not participate in the STEVIN programme. In the past three years less than 15 events have been sponsored, which is quite below the expectations.

A recent initiative has been to open up for small scale (maximum 55K €, 1 year) activities to promote HLT in secondary and higher education institutions. The educational activities are intended to raise the awareness about the possibilities of HLT amongst students and pupils. This call for educational activities is too recent for any conclusion.

2.3 The European Research Area

The European Union wants to create a European Research Area (ERA). One way is by supporting ministries and agencies to have them pool national money for research in transnational research programmes. The aim is to achieve economy of scale effects and stimulate competition amongst the researchers. The EU expects this to lead to enhanced excellence in European research.

The STEVIN programme, coordinated by the NTU, perfectly fits in the spirit of these ERA-nets. The only difference is that currently only two countries are involved. The participating Dutch and Flemish agencies apply the "real common pot" scheme. The funding parties bring their money together[10] and loose track of its origin. Also, the necessary "funding infrastructure" has been set up (various procedures, instruments, reporting formats and the like, a programme office to ensure proper monitoring of the projects, selection of international experts to evaluate the proposals, …). Thus, the STEVIN programme has been set up in line with European research funding policy and according to best research programme management practices.

3. Coping with more aspects of the HLT resources life-cycle

It has been an explicit aim of the policy makers in the HLT steering board to stimulate collaboration between academia and industry. Therefore, in addition and preliminary to the STEVIN measures presented in the previous section, a central contact point and central repository (HLT agency) have been put into place. In this section, we report on how these initiatives have been extended as a result of the STEVIN outcomes. In particular, a price policy committee (section 3.1) as well as an HLT PR & Communication working group (section 3.2) have been recently created – see Figure 1.

3.1 Setting the right price

At the end of a STEVIN R&D project, the ownership and rights of the results are transferred to the NTU and the materials are physically handed over to the HLT Agency[11]. In a context of research centres supposed to market and exploit their research results, transferring ownership to a central (inter-) governmental organisation seems less obvious. Usually universities or research centres become owners of the research results generated thanks to government funding. However, the ownership transfer makes sense when considered from the point of view of what is called *open innovation* (Chesbrough 2003) or *user driven innovation* (von Hippel 2005). It essentially means that ideas, materials, tools etc. float around and that new

[9] www.klinkendetaal.nl (website in Dutch)

[10] A funding proportion between Flanders and the Netherlands (1/3 vs. 2/3) has been agreed. The scientific selection process determines the ranking of project proposals and thus the distribution of the funding. Attention is paid to the ratios between speech and language proposals, academic and industrial involvement, and Flemish and Dutch participation. The TST steering board (normally) approves the ranking by the scientific reviewers and checks the participation balance.

[11] Note that transferring the ownership does not mean that researchers cannot work any longer on their material. With a simple free license contract, they can still use their results.

products and services are the result of users playing around and creating new things before these are picked up by industry. Consequently, easy and non prohibitive access to knowledge, data, tools and the like is key. Spending large amounts of money on licensing in technology hampers experimentation. Hence, some innovation scholars advocate that IPR regulations (meant as a compromise between protecting and opening up knowledge) should be drastically changed.

Therefore, the HLT steering board decided that for non commercial use the resources and tools available from the HLT Agency should be provided for free, unless protected background material is involved. If this is the case, a fair license price has to be agreed upon. The HLT agency can even purchase a license for the benefit of the entire Dutch HLT community (as has already happened).

For commercial use, the price to acquire licenses should be relatively low. At least it should not constitute a financial barrier for (innovative) SMEs in the sector. In order to determine a suitable price for a license for commercial use, an HLT price policy committee has been created. Flemish and Dutch members are technology transfer officers from independent research institutes, representatives from industry, as well as a researcher on open innovation.

Open source licensing is also possible as it serves the same purpose, namely allowing easy reuse and improvement of resources by third parties. When research groups are willing to further develop and maintain their resources and tools themselves, it might be more practical that the research group(s) concerned turn to open source licensing schemes. Alternatively, the HLT Agency can conclude service contracts with the original creators of the resources or tools. This particularly might be the case with the maintenance of software as this requires in depth knowledge and very specific expertise. In the case of open source, some agreement or link with the HLT Agency remains necessary for the latter to maintain itself as a one-stop-shop for Dutch HLT. The lack of such a one-stop-shop in the previous years has been a main reason why available resources were not widely known and/or available for the field. As an obvious consequence, government funding has been wasted over time. A careful scrutiny of the precise open source license however is needed as the various open source licensing schemes imply different degrees of freedom to operate.

3.2 Not any publicity is good publicity

The availability of resources at the HLT Agency is only a first step in stimulating the uptake by innovative HLT companies in the Netherlands and Flanders. A communication strategy must also be set up to create widespread awareness within relevant target groups. The main message is that incorporation of HLT for Dutch improves the added value of products and services, improves the user experience, and leads to cost reduction. E.g., HLT-enhanced domotics software allows people to call their virtual house valet and have it switch on the heating in the bathroom when one plans to arrive late at home in winter and wants to take a bath. The recent trend in car navigation is that navigation systems support the local languages(s) of the markets/countries targeted. Associations of impaired people might want to press producers of supporting devices to extend the functionalities of these aids with HLT to achieve a higher level of wellness or wellbeing for their users.

The examples above illustrate that specific messages on the advantages of HLT must be addressed to the various target groups. In order to deliver correct, clear, non conflicting messages, the supplying parties must speak in a coordinated voice. This guarantees in addition that all the parties concerned (financing bodies, developers etc.) receive fair credit and that their interests are respected.

Therefore, an HLT PR & Communication working group has been set up. This working group consists of PR and communication specialists of the member organisations of the HLT board. It is coordinated by the NTU to avoid duplication of efforts and to provide a stable basis. This new PR&Comm. working group is an almost natural extension of the existing HLT info desk (see section 2.1). One of its assignments is to develop a common communication strategy in order to create widespread awareness within relevant target groups. It will create a common public image and branding material, such as flyers and brochures. Promotional efforts of the STEVIN programme thus can benefit from material made by the professionals of the HLT PR&C working group. The HLT Agency is also represented in the PR&Comm. working group in order to achieve synergy and avoid duplication of dissemination efforts. The main message is that incorporation of HLT for Dutch improves the added value of products and services. Especially in Flanders, positive messages about HLT are needed as the Lernout & Hauspie Speech Products NV bankruptcy is still etched on people's mind.

In 2008 a large conference Taal in Bedrijf[12], will be organised. It is the Dutch-Flemish counterpart of LangTech[13] and will bring together companies from the HLT (for Dutch) sector and related fields with actual and potential users of speech and language technologies. The conference will be organised in close cooperation with the STEVIN partners and NOTaS, a foundation established in the Netherlands by a number of Dutch HLT providers and knowledge institutes to jointly protect their interests. The conference programme will be designed such as to attract different potential professional users of HLT, with different business cases from sectors such as education, health care, public administration, media and security.

[12] Taal in Bedrijf is intentionally ambiguous between "Language in Business" and "Language in Action".
[13] http://www.lang-tech.org/

4. Shaping a new HLT programme

4.1 Evaluating the past

Well designed research and innovation programmes have set explicit (high level) objectives on beforehand (ex ante) and described the situation of a field at the start. Assessing afterwards (ex post) the impact of a programme on science and industry nevertheless remains a complex and difficult task. To that end a double survey (one for academia and one for industry) establishing a base line reference[14] has been issued (Akkermans et al. 2007). At the end of the programme, a final and overall assessment is scheduled. Existing studies [15] provide additional information. At the time of writing a mid-term scientific evaluation is being carried out.

4.2 Preparing the future

In parallel, preparations are already being made to pave the way for a successor programme. The HLT steering board has expressed its desire to put more focus on industry and end-users as a fair amount of basic resources will have been developed in the framework of STEVIN-I. From a policy viewpoint, the notion of *horizontal innovation* is promoted to the forefront. It means that HLT is seen as an enabling technology for a very broad range of products and services. For instance, HLT can be applied to improve the quality of life and (subjective feeling of) security of elder and /or disabled people. This could involve social welfare, health care, security, logistics, domotics, consumer electronics etc. Other topics, promoted by the NTU, concern the use of HLT in education, health care and government. It implies that government departments and agencies other than the traditional science and technology departments potentially become involved as funders and in the future could participate in the HLT steering board.

Governments can stimulate industry by acting as clients or buyers of innovative applications. E.g., HLT supports language learning and testing for immigrants to achieve a faster and better integration of new-comers into the Dutch society by bridging the language gap. Also the EU promotes *innovative procurement* (the government as launching customer) as a policy instrument to boost the adoption by the market of new innovative products and services. This should be more looked into. Imagine for instance the impact on local HLT industry a decision would make to have each city administration install an HLT-enhanced information portal and a telephony dialogue system driven FAQ service.

Ideally, HLT steering board members should organise (in their specific field and country) what are called technology forecast exercises to come up with a vision on the role of HLT (for Dutch) within the next 5 to 10 years. A representative sample of relevant actors in the field has to be involved to ensure a broad support of the future vision. Several scenarios can be sketched and discussed. Afterwards, the necessary (financial) means should be made available to realise such a future scenario. Finland has already organised such a foresight exercise that takes HLT[16] into account.

Initial brain storm sessions have been organised in Flanders and the Netherlands separately. In the Netherlands, synergy is sought with a national HLT research programme (IMIX [17]). The Flemish EWI department[18] is organising an HLT forecast. EWI applies the Delphi-method (with supporting software) to structure the reasoning of relevant Flemish HLT actors and deal with their possibly diverging views. The participants anonymously attribute scores to statements about a new HLT programme. They express the extent to which they agree with the statements and assess the feasibility. The software is a web-based group decision tool. It detects the major trends, correlated answers and perceived opportunities.

At the Dutch-Flemish level, the NTU is conducting surveys similar to the one that led to the STEVIN programme (the so-called BLARK survey (Binnenpoorte et al. 2002a)). These aim at identifying minimum common sets of HLT resources useful for developing applications for the education sector and for the sector of communicative disabilities. The rationale behind this initiative is that if indeed it is possible to identify such a core of resources that could be employed for developing applications for a wide range of users in these sectors, then it would be easier to convince policy institutions to finance the development of such HLT resources.

During the HLT industry fair (Taal in Bedrijf[19] - see section 3.2), results of the various brain storms and forecasts will be presented for public discussion.

5. Conclusion

Even if it is too soon for a final assessment of the STEVIN programme, we can already state that the programme has succeeded in bringing academia and industry from Flanders and the Netherlands closer together. In addition, industry seems to well appreciate the calls for demonstration projects. SMEs have been able to find new customers and create new products and services thanks to the STEVIN funding. Moreover, thanks to (partially funded) dissemination and promotion activities of enterprises participating in demonstration projects other professional end users and software integration

[14] Strictly speaking, the survey has been carried out during the second year of the programme.

[15] www.tc-star.org/pubblicazioni/D17_HLT_ENG.pdf and www.technolangue.net/article.php3?id_article=332

[16] www.tekes.fi/julkaisut/Finnsight_2015_EN.pdf (chapters 7-8)

[17] http://www.nwo.nl/imix

[18] http://www.ewi-vlaanderen.be

[19] See http://taalunieversum.org/taal/technologie/taalinbedrijf/ on the 2005 edition (website in Dutch)

companies are becoming more and more aware of the (commercial) potentialities offered by HLT for Dutch. Professional PR and communication (coordinated by the specific working group) reveals to be instrumental in that respect. Together with the HLT price policy committee the Flemish-Dutch HLT initiative has been strengthened with instruments that emphasise the innovation aspects of the STEVIN programme. Finally, the transnational collaboration between Flanders and the Netherlands on the institutional level sets a nice example for other innovation and HLT policy makers. All in all, a sound basis to elaborate a STEVIN-II programme.

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7. References

Akkermans J., Hochheimer-Richheimer D. & van Rij I., (2007), *Nulmeting STEVIN: startpunt voor bepaling effect STEVIN-programma*, M&I Partners, Amersfoort

Beeken J., Dewallef E. & d'Halleweyn E., (2000), A platform for Dutch in Human Language Technologies, In *Proceedings of LREC 2000*, pp. 63-66

Binnenpoorte D., Cucchiarini C., d'Halleweyn E., Sturm J. & de Vriend F., (2002a), Towards a roadmap for Human Language Technologies: Dutch-Flemish experience, In *Proceedings of LREC 2002*

Binnenpoorte D., De Vriend F., Sturm J., Daelemans W., Strik H. and Cucchiarini C., (2002b), A Field Survey for Establishing Priorities in the Development of HLT Resources for Dutch, In *Proceedings of LREC 2002*

Boekestein M., Depoorter G., van Veenendaal R., (2006), Functioning of the Centre for Ducth Language and Speech Technology (TST Centre), In *Proceedings of LREC 2006*

Chesbrough H., (2003), *Open Innovation: The new imperative for creating and profiting from technology*, Harvard Business School Publishing, Boston, MA.

Cucchiarini C., d'Halleweyn E., Teunissen L., (2002), A Human Language Technologies Platform for the Dutch Language: awareness, management, maintenance and distribution, In *Proceedings of LREC 2002*

Cucchiarini C. & d'Halleweyn E., (2004), The new Dutch-Flemish HLT programme: a concerted effort to stimulate the HLT sector, In *Proceedings of LREC 2004*

D'Halleweyn E., Odijk J., Teunissen L. & Cucchiarini C., (2006), The Dutch-Flemish HLT Programme STEVIN: Essential Speech and Language Technology Resources, In *Proceedings of LREC 2006*, pp. 761-766

Maks I., Tiberius C. and van Veenendaal R., (2008), Standardising bilingual lexical resources according to the Lexicon Markup Framework, [this volume]

von Hippel E., (2005), *Democratizing Innovation, Cambridge*, MA: MIT Press.