Dematerialization and the Environment: a text-mining landscape on academic, blog and press publications

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Abstract—This paper presents the methodology and results of an exhaustive text-mining analysis performed on the subject "Dematerialization and Environment". Three main fields have been investigated: international academic publications (documents extracted from the Web of Science database during the period 1994-2013), French blog publications (pages crawled on the web for the years 2011-2012-2013) and French newspaper publications (articles published between 1993 and 2013).

Lexical extraction, word specific selection by experts and co-wording analysis were performed to produce thematic maps for each domain. Moreover, interviews were carried out with experts, researchers and practitioners to interpret the maps.

The results presented in this article mainly show a semantic landscape focused on "telework, telecommuting and coworking" related activities. Semantic and historical evolutions highlight new working spaces such as "third places" impacted by digital uses and social practices. They reveal the main environmental issues practitioners have to tackle in a prospective way given the complexity of this emerging field.

Index Terms—text-mining, complex systems, graph analysis, academic publications, web-blogs, newspapers, telework, telecommuting, coworking, third place

I. How does ICT induce societal change on environment ?

With the concept of "dematerialization" many intervenants from many fields of expertise claim the respect of the environment for a so-called "sustainable" society. Indeed much work have been emerging, with the activity of multiple networks of researchers, journalists or bloggers not specifically connected to each other, but united by the desire, the belief, or the opportunity of a clean growth. But for now the question remains whether we can map the "story" of such societal change on environment induced by ICT? The methodology put forward in this paper appears as a reflexive and interdisciplinary process to initiate collaborations among a heterogeneous networks of interveners.

Hence the results in the production of academic literature, blogs and newspaper publications present several difficulties in their scope since the dissemination of heterogeneous sources and expertise hardly enable prospective understanding of the development of these many socio-technical fields. This context leads to a lack of visibility of the results. Recognizing this issue, the French Agency for the Environment and Energy Management initiated this innovative project in order to map "Environmental and virtualization studies".

Dematerialisation is understood here as a more extensive area than a single process of "digitalisation". Digital sometimes only means digitalisation of paper documents, which is too specific for our purpose. However, with dematerialisation, this research paper aims to obtain a map of the state of literature generated on the theme "environmental changes induced by ICT". The whole literature on this subject proposed different layers from the white literature freely accessible to grey literature, i.e. not accessible literature, either because it is as yet unpublished or unpublishable for reasons of intellectual property issues. The proposed solution is firstly to map white literature and then address the grey literature by looking at the maps in our discussions with French experts. The result is one interpretation of the complex interactions induced by this emerging field.

The corpus for academic literature is related to both English and French publications, as scientific work is very often shared at a global level, and most French researchers publish in English. French blogs and newspapers are especially crawled, in order to detect "cultural" distinctive features associated with the study main topics.

II. Methodology

The study started with the exploration of academic literature to specify the frontiers of the subject "Dematerialisation and environment" specifically from a scientific point of view. Then some thematic areas were chosen in order to find a pathway through the landscape of this specific concepts. After this step, new data were gathered from the web and newspaper publications to embrace societal changes within a dialog with selected actors[1].

A. Starting from the academic literature

To make a choice among all academic literature, some keywords had to be selected. Then scientific monitoring and technology intelligence of "French Environment and Energy Management Agency" (ADEME) experts were analysed in an ethnographic way. The digital observation of an ADEME expert's daily work was carried out. Working documents' folders names, email classification schemes and web browser bookmarks were gathered. Then a textual and statistic analysis was used to reveal his most significant key terms. With these words, the search equation was formulated to extract documents from scientific databases.

The SI Web of Knowledge is an online bibliographic academic database provided by the Institute for Scientific Information (ISI); its broad coverage enables such collaborative and interdisciplinary methodology. Each expert has been invited to contribute to the first search equation dealing with "Environment AND Dematerialisation" by adding her/his own specific words. After some iterations, the search equation dealing with "Environment" related terms and "ICT" (Dematerialisation) related terms resembles the following patterns:

- Environment related terms: "ecolabel", "material flow analysis", "life cycle analysis", "environmental sustainability" ,"environmental impact" ", "environmental policy" ", "CO2 emission" ", "rebound effect", "waste prevention", "environmental footprint", "ewaste", "Waste Electrical and Electronic Equipment" ,"WEEE ", "Waste management", "waste reduction", "Air quality" ,"Traffic congestion", "fuel", "energy efficiency", "gray energy", "embodied energy".
- ICT (Dematerialization) related terms: "co-working", dematerialization", telecottage", smart work "center", Videoconferencing", home automation", building energy "management system", smart building", smart cities", smartgrids", "smartmeters", internet of things", ecodesign", ICT", greenit", "industrial ecology", machine to machine", data center", home "working", work from home", home automation", smart home", "carsharing", bike sharing", road toll", congestion charging", "driverless car", public transportation", vehicle to grid", vehicle "to vehicle", vehicle to infrastructure".

At first sight, other experts (i.e. maybe the reader of this paper) who did not participate in the search equation process may want to add some others words, thinking some areas are lacking. It is worth emphasizing that the reflexive process is mainly accompanying implied actors. Then at any time of the exploration this search equation can be modified. This paper only shows a snapshot view in the whole process.

As a temporary result, nearly 2,000 references of scientific articles constituted our first corpus. The corpus has been extracted from the Web of Knowledge database in English on Monday 2nd of September, 2013. The corpus is made from 1,968 documents of which documents are already typed with databases own categories. Two main kind of categories can be used, the type of publication and the topics related:
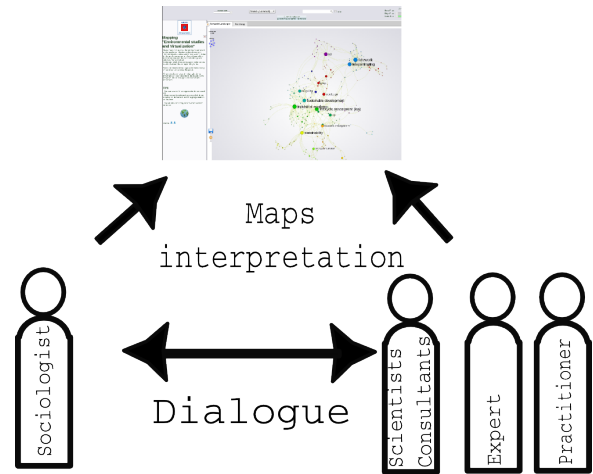

Fig. 1. Steps contributing towards the reconstruction of temporal maps

1) Type of publication
   - 1 182 articles
   - 798 proceeding papers
   - 48 reviews
   - 8 editorial material
   - 5 chapter from books
   - 2 meetings minutes
   - 1 software review
   - 1 news
2) Main topics related:
   - Environmental Sciences (650)
   - Engineering Environmental (578)
   - Engineering Electrical Electronic (392)
   - Energy Fuels (165)
   - Telecommunications (143)

Histograms produced with dates of publication show the growing interest for these subjects. However, such terms and categories mainly reveal the big frontiers between fields of expertise. It is worthwhile to understand that at this point of the process, the contributors to this experiment do agree with the search equation which embrace the spaces of the scope. After this step, text-mining analysts are building some semantic maps to produce another representation of the field in order to highlight the interactions between the different fields of expertise. Indeed, what are related impact of "dematerialization" of our environment? This issue is big, complex and maybe there is no consensus on such question. That is why a textual map of this corpus has been carried out in order to serve as support for further discussions.

B. Text-Mining steps to produce semantic maps of the fields

The reconstruction of science process is based on the text-mining phylomemy methodology which can be divided into four steps (cf. fig.6)[2]:

1) Mining and indexing of key-phrases inside a corpus,
2) Measuring proximities between key-phrases,
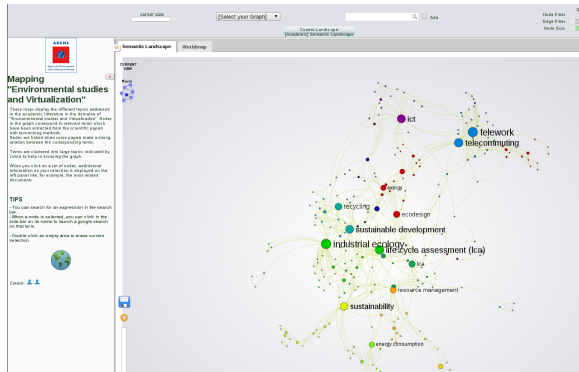3) Clustering key-phrases into scientific fields,

Fig. 2. Academic Semantic Landscape

Fig. 3. Sketch showing the interview step

4) Inter-temporal matching between thematic fields.

The matrix of clusters has been projected in an euclidean space following graph analysis which enables maps views displaying the different topics addressed in the academic literature in the domain of "Environmental studies and Dematerialization". Nodes in the graph correspond to relevant terms which have been extracted from the scientific papers with text-mining methods. Nodes are linked when some papers make a strong relation between the corresponding terms.

Terms are clustered into large topics indicated by colors to help in browsing the graph. If the explorer (i.e. experts or consultants or researchers) clicks on a set of nodes, then additional informations on the selection are displayed on the left panel like, for example, the most related documents. In addition, explorers can search for an expression in the search bar. When a node is selected, the explorer can click on its name in the side bar to launch a search on the web specifically on that term. By double clicking an empty area the explorer erases her/his current selection to continue the exploration in another area.

With these maps as supports, interviews have been carried out with experts, researchers/consultants and practitioners to interpret the maps. To date 9 different persons have been interviewed (3 for each category).

C. Interviews for the reflexive process

The interview step is part of an iteration process to improve the quality of the maps. As an example, a first iteration was been conducted, i.e. a set of maps was produced and communicated to the ADEME experts. Once the methodology had been well understood by the people involved, a new search equation was formulated in an iteration process. This equation allowed the extraction of the final corpus and the implementation of mapping for analysis. From that basis, interviews were conducted with the experts, consultants, researchers and practitioners. The result is a reflexive process that helps intervenants to have available a shaped representation of the strategic fields in a network form.

At the interview step, considering each sub part of the map, the expert of a specific field will probably learn a few things. But it is worth underline that complex interactions between
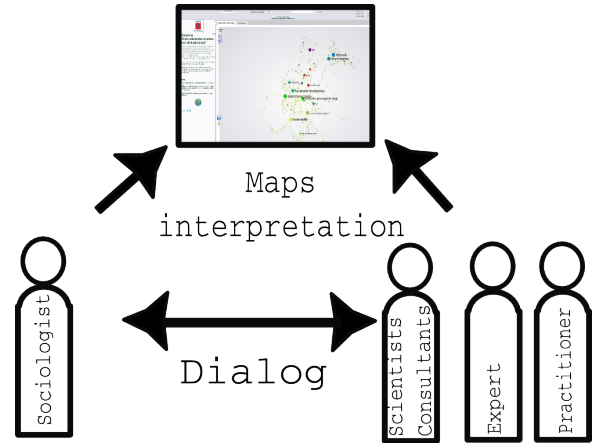
each field of expertise, i.e. interactions between sub parts of the map, are highlighted. There

the possibility of a relatively comprehensive synthesis that exceeds the borders of each individual expertise individually. Indeed, from academic papers, at the middle level, an interpretation can be carried out on the subject "Dematerialization and Environment".

III. ONE INTERPRETATION IN THIS THEMATIC LANDSCAPE

One interpretation of this thematic landscape can be understood as a voyage through the data. Other interpretations and other courses are possible, depending on the experts interviewed and the subject chosen.

A. Academic publications overview

The academic and semantic landscapes (fig.4) show the main topics on the subject.

The main nodes are "Sustainability", "sustainable development", "industrial ecology" and "life cycle assessment", "ICT" and "telework". They are the main topics or domains of the network.

Other peripheral nodes are main key concepts such as "recycling", "ecodesign", "ressource management", "energy consumption".

At first sight, the map reveals the main tensions between ICT and sustainable activities even if the ICT nodes are not central to the environmental clusters. However, they are vaguely connected in time showing this emerging field.

Entering the network, we can see that "ICT" and "sustainability" are not really connected (at least as yet) but a peripheral cluster indicates "telework" activities whose nodes are connected to environmental meta-analysis. This field differs from other nodes as it appears as social practices i.e. new work practices within an ICT environment. Indeed, many users are implied whose behaviours cause new perspective issues for the environment.
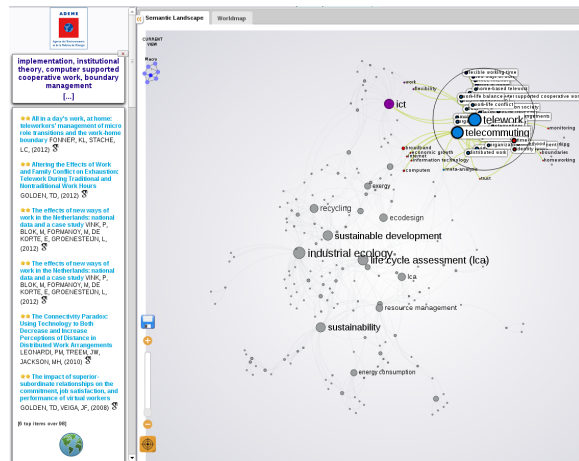
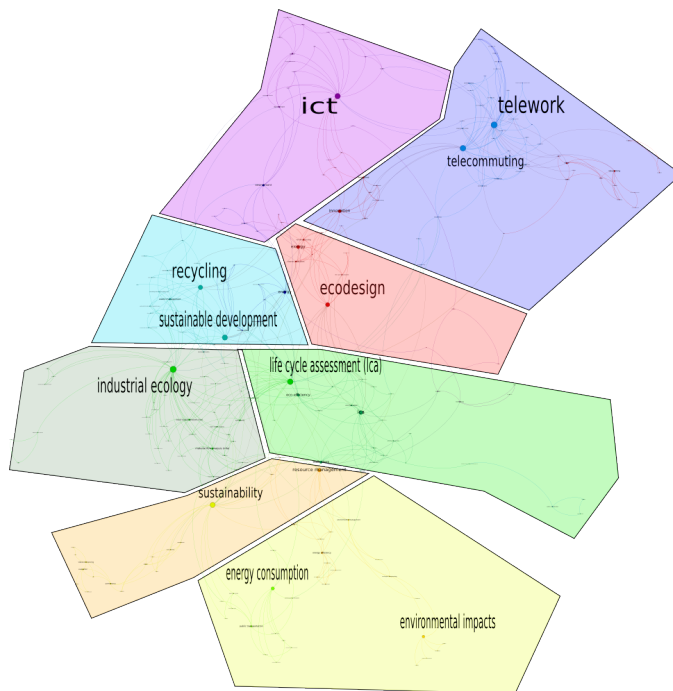Fig. 4. Academic semantic landscape and focus on the "telecommuting" node

Fig. 5. Academic Semantic Landscape with thematic areas

1) Main landscape: From the academic publication overview, even if we denote significant differences between publications from different countries, 3 main phases emerge from the analysis of the maps. From a temporal comparison, with philomemy maps, one can distinguish the main periods according to the premisses, paradoxes and structuring phase of the practices.

1) the years 1990-2003 describe premisses of ICT implications on Work. At the end of the 20th century, with the notable emergence of ICT, scientists began to foresee the future evolution of distributed work;

2) the years 2003-2010 refer to a paradox era. Reality of the first telework implementation did not really match the

expectations. The surveys became more concrete with new environmental issues which are emerging slightly.

3) the years 2010-2013 represent the diffusion of users' practices on telework, revealing new issues. Methodologies to understand and better measure the environmental impact of teleworking related activities were published.

2) End of 20th century: premisses of the changing world (1990-2003):

a) European pioneers: the Netherlands with an active community of researchers in Amsterdam: Workers throughout the world have not adopted telework, starting at the same time and spreading with the same speed. Analysing the locations of the publications filtered with empirical analyses makes it possible to produce a first qualitative interpretation of the maps. We focus here on the Netherlands, a country already well known for its advance in the area of telework implementation. This analysis shows up the fact that a practice network and research community has early been involved to develop telework and telecommuting related activities.

In the early 1990's the first experiments on "teleworking" activities in the Netherlands were described. For example, results of a study revealed the impact of "teleworking" on the travel behaviour of the participants in the experiment and mainly on the travel behaviour of their household members. It was concluded that teleworking resulted in a significant decrease in the total number of trips by teleworkers especially at the car traffic peak-hour. The main unexpected result dealt with household members of the teleworkers who travelled less than before the experiment [3]. As an example of a complex phenomenon analysis, this study revealed that the diffusion and topology of networks of social practices have to be taken into account.

Moreover, during these seminal experiments many studies were published by Dutch researchers to better understand telework related to telework around the world. In Japan [4], Singapore [5] or in the United-States [6] practices are analysed in a state of the art that appears to be exhaustive.

In 1990, factors associated with attitudes towards telecommuting [5] were analysed starting with a quantitative survey carried out in Singapore that highlighted the teleworking way of life with social values for the changes happening.

In 1991, environmental and more generally speaking "quality-of-life" issues were mentioned as good reasons to describe the context and the needs of telework impulses. "Advances in telecommunications and a growing awareness of the need to change how we live and function in an increasingly threatened environment have brought telework to the forefront of the debate on the nature of work and how our cities function. After setting out the broad Japanese social context, researchers looked at the progress of telework in Japan to date with especial emphasis on several current satellite and resort office pilots [4]".

In 1991, another state of practices provided an overview of the status of telecommuting in the United States, especially as it relates to changes in travel behaviour. It reported several policy statements involving telecommuting, and explored the

appeal of telecommuting as a public policy instrument. It highlighted some trends in the implementation of home-based and work center-based telecommuting, and suggested that visible public-sector involvement has been crucial to the increased activity in this area [6].

All these research works in the context of the early 1990s explain the favourable conditions for telework development. Nevertheless, it is also noticed that telework needs to be tailor made depending on local specificity . As a consequence, the acceptation of the principle had not yet enabled fast and large scale promotion of telework in the Netherlands [7] during the 1990's.

b) Main motives for telework spread in publications: Apart from localised concerns in each country, a trend of motives emerged in favour of telework activities (also called home-based work or telecommuting). Indeed, "a new paradigm for the next century" clearly shapes the near future according to the authors. "Things like Telework and Telecommuting are going to be common ways of work on the near future. But this connected legion requires a new ways of interaction and market approach [8]". Information technology (IT) seems to be the facilitator for the successful implementation of distributed-work. However, research works into the implication of different types of IT in distributed-work in an organization are at first limited[9]. The case of teleworking symbolized the changing world of the work socio-economic work and positive implications[10]. Mainly, there were breaks from the traditional routines of employees who share a work location and see each other on a daily basis. Each of these breaks constituted a challenge for companies and their managers but also an opportunity. Authors also expect telework to appear very different in the next few years [11].

However some negative aspects appear. An economic prospective study foresees that high speed home networks may lead to high speed non-public networks (consumer communication networks) within ten years[12], showing the key to success for communication infrastructure.

Socially, the impact of telework on information professionals' work processes [13] and worker autonomy could be the drama of digital networks in organizations [14]. Reviewing the most central scholarly literature and examining the phenomenon of telework six major appear. These are related to the definition, measurement, and scope of telework; the management of teleworkers; travel-related impacts of telework; organizational culture and employee isolation; boundaries between "home" and "work"; the impact of telework on the individual and the family. [15]

At this stage of the subject, we can see that environmental negative issues are not really mentioned: ICT and related work changes appear to become a solution for the environment as one of the policy options for transport to reduce CO2 and tropospheric ozone [16].

3) 2003-2010: The early 2000's are unveiling the paradoxes: A new phase of the telework activity era shows some paradoxes of the individualisation of telework on human resource management. The case of telework appears more paradoxical than previously thought [17] and authors wonder how to measure the supposed changes [18] ?

With the first implementations of telework activities, researchers began to make a diagnosis not only with qualitative analyses but with quantitative research that produces measures of teleworking activities. For example "the role of relationships in understanding telecommuter satisfaction" [19] has been analysed and sociological studies on white-collar telework are assessed between work overload and learning a new organisation of time[20].

However, the level of teleworking still seem to be still low in the United States whereas access to the relevant technology has increased so much in the past decade in the Scandinavian countries and in most other Western countries. Such an issue is the starting point for studies to determine the reasons of different effects on transport in terms of substitution, production, and changes in travel patterns [21].

In Europe, researchers attempt to identify the determining background factors for the introduction of telework and to understand their operative mechanisms. Factors determining the introduction of telework in five European regions have been published comparing organisational factors[22].

In 2001, the first publication appeared pertaining to a tool to analyse the environmental and economic impacts of telework over a set of likely parameters and scenarios. This exposed crucial system components and sensitivities. It is expected that the analysis provided by web tool should enable commuters, employees, company managers and regulators to gain a better understanding of telework-related environmental impacts [23].

Two years later, in 2003, energy-related emissions measured in a telework study found that telework has the potential to reduce air emissions. However, simulations employed to perform a probable analysis over a set of likely parameters revealed that telework may not equally affect the emissions of all types of pollutants. It may decrease CO2, NOx, SO2, PM10, and CO but not N2O and CH4 emission. Therefore, the scope and goal of telework programs should be defined early in the implementation. Work-related transportation (commuting) impacts could be reduced as a result of telework; however, home-related impacts due to an employee spending additional time at home could potentially offset these reductions[24].

More precisely transportation choices could induce air pollution effects of telework. The same authors who carried out the study explored how the mode of transportation and others parameters such as miles travelled by a vehicle, vehicle model, occupancy rate, telecommuting frequency and season (heating or cooling required) affect the air pollution effects of telework programs when energy consumption-related emissions due to heating, cooling, lighting and the use of electronic and electrical equipment (at home and at the company office) are accounted for. Among others, the study showed that the total telework-related CO2 emissions during the cool season and SO2, NOx, and hydrocarbon emissions in both cool and hot seasons appear to be lower than non telework emissions for all modes of transportation (except for light rail with higher NOx emissions and urban transit buses with roughly equal
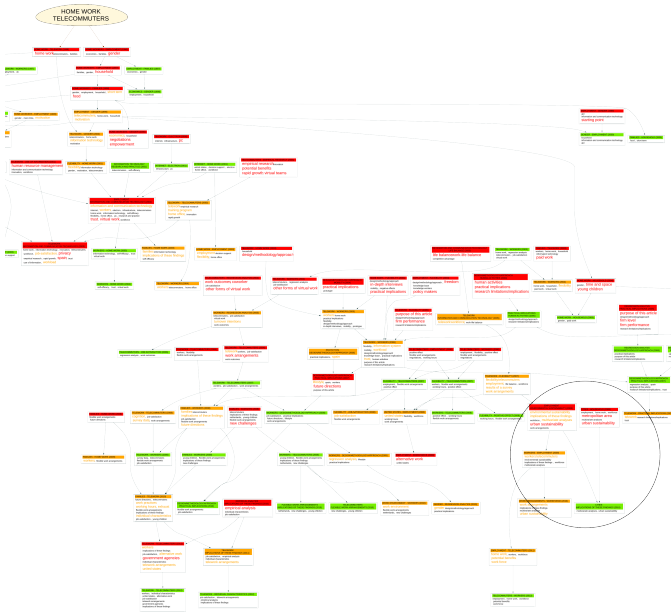
Fig. 6. Phylogeny focusing on urban benefits thanks to telework related activities. The years can be read from top to bottom in the map.

NOx emissions in the heat season)[25].

External air pollution costs of telework are highlighted. Indeed, the authors' assessment evaluates how telecommuting alters transportation, residential building, and commercial building energy consumption patterns and related equivalent CO_2 ($CO_{2,e}$) emissions[26]. Some case studies, especially in the US try to measure the energy and greenhouse gas emission impacts of telecommuting [27].

However, the e-waste production caused by teleworking activities has not been really investigated maybe because telework is a border consequence of a digital society.

4) 2010-2013: Structuring the practices: As shown in the previous section, during the 2000's decade telework experiments implemented in "advanced and developed" countries started to draw the interests of understanding their feedbacks. In the early years of the 2010's, the time has come to understand the benefits and challenges faced by Worldwide Federal Governments in implementing the telework programs[28]. The efforts to understand telework benefits and challenges aim to serve as a major basis to consider the adoption of any telework program. This context is the structuring phase of teleworking practices. Intensive literature reviews make it possible to obtain a significant landscape of telework issues.

Many publications detected positive effects of teleworking mainly: society could enjoy new job creations with less environmental pollution and work redistribution in terms of social benefits, employers gain competitive strength with less disruption of operations and better services. Then work from home raises productivity[29]. By remixing work, family and leisure, the teleworkers' experiences of everyday life are altered[30][31]. Employees can enjoy a flexible time schedule, with better dependent family care and with less commuting

costs and time.

It is commonly believed that telework is good for the environment, because it saves energy through reduced commuting. Millions are now teleworking worldwide. Environmental feedback shows how to decrease the carbon footprint in cities such as Mexico[32], Brussels [33]). Even though ICT represents only a small part of the world's energy use, its aggressive, successful, continuing pursuit of reduced electricity use and lower carbon footprint is a model for other sectors. [34]

However, some weaknesses of telework programs have been detected. Some experiences met upper management resistance and the difficulty of measuring employee productivity was cited[28]. Furthermore, teleworking may alter work and family boundaries [35]. Managers may need to be more aware of the full range of characteristics that encapsulate the teleworkers work practices before making decisions about how telework is implemented. Co-working spaces may be not the solution. Special attention is needed concerning workers that need to be able to concentrate and need to personalize their work environment. In implementing new ways of workng these issues need attention. [36]

"Some peer-reviewed publications over the last decade have shown that the principles of life-cycle assessment (LCA) have to be applied to telework, just like to other products and services. Then one arrives at a comprehensive assessment of all facets of telework: transportation, building use (heating, cooling and lighting), electrical and electronic equipment use and information and communication technology. Seen through the lens of LCA, telework may turn out to be beneficial, but not everywhere and on every occasion. Indeed, it has been found that telework depends on the individual or on collective scenarios and modes of implementation. It is debatable whether telework can bring environmental benefits for an individual, company, or state[37]". However, a critical mass of studies has been realised[37].

Finally, no program offers 100 percent unlimited benefits. Telework, in this case, is no different than other work organizations. Since no one is applicable to all situations, further adaptation of telework policies to suit different government agencies' specific needs is an important approach to ensure its success[28].

B. Comparison with others corpus

The previous academic overview was compared to blogs and French publications and newspapers[38].

This paper only shows the main trends of this comparison: if academic literature mainly focuses on structural trends, blogs and newspaper publication mainly mention cyclical factors of teleworking development. These new data do not really present the effects of teleworking on environment mainly (or only) as positive effects.

In further research, comparisons with other countries (and also different languages) could enable an empirical analysis of the steps of telework diffusion.

1) The Weblog sphere: On the Internet websites, telework agreements in the services sector are mentioned as steps of
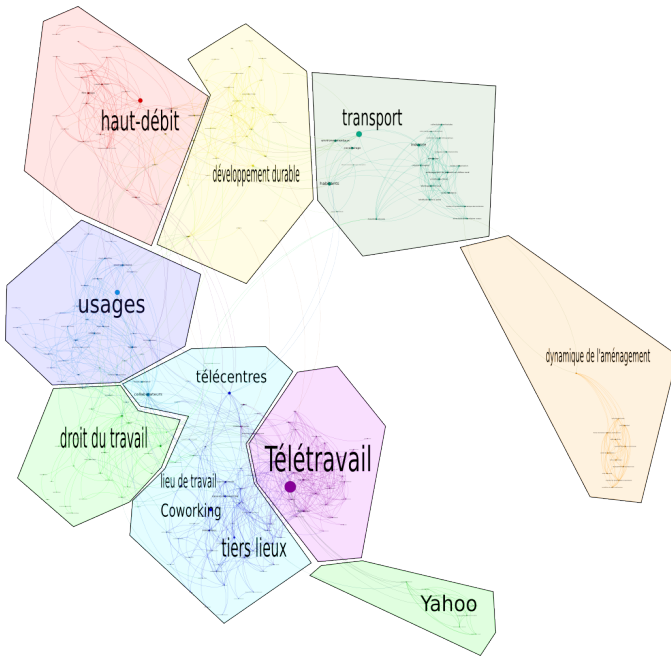
Fig. 7. Blog semantic landscape in the French blog spheres.

Fig. 8. Press semantic landscape in the French newspapers publication dealing with telework.

a major trend accompanied by legal developments. The same areas of the maps also mention the absence of agreements such as the Yahoo event in 2013. This company publicly stopped telework as a consequence of new management decisions. However, the "Yahoo" cluster is not in the centre of the map. The position of this cluster do not only reveal the exception conditions of such a decision but also reveals a qualitative reading of the articles, which shows that Yahoo management has not been understood by bloggers. Indeed, bloggers usually mock this decision that goes against a background pattern.

Near to this agreement cluster, the nodes mention the good practices of the teleworkers. The teleworker (or telecommuter) does not appear only as a worker but as a "user" who chooses her/his own tools. These users mention how they manage to overcome distance from their "collaborators" using new software applications. This fact does not only deal with tools but highlights a power decision. Indeed, during the interviews bloggers and practitioners mention the freedom advantage obtained against their own IT department by choosing their own working tools. Using software "in the cloud" to destroy their technological dependence on the firm is a major trend. However, the users recognise that the decision is not really unsafe on the security axis. The advantage of this new software appears to be chosen to increase their mobility in new work spaces.

The surge of the "third space" notion symbolises the fact that near to home and work spaces, new working spaces have been discovered by the workers. Furthermore, co-working space offers become a promising market. These new working places renew two main issues: the telecommunications means and speed, and traditional means of transport. These two subjects are mainly addressed by newspapers publications.
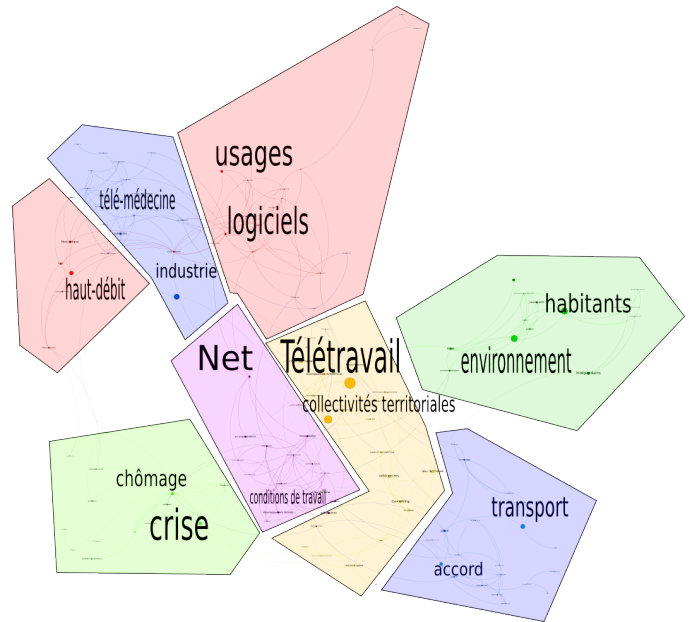
2) Newspapers publications: Near the "user" cluster emerges the "legal" clusters: working at home needs worker protection by new rights. The legal discussions in French parliament are widely covered by the newspaper press as a new step forward for social working change. Indeed, as the practices become concrete, organisational management in companies must follow the legal position. However, some practitioners still find that workers can hardly argue in favour of teleworking. Thus, some associations are publishing books to argue the economic and social cases for telework related activities.

The press publications mention the cyclical good reasons to develop teleworking activities. During strikes in the public transports, in case of bad weather such as a snowstorm, or flu risks, working at home presents new benefits to continue activities whereas external conditions could interrupt them.

The national press does not often publish on telework subjects whereas Regional press are the main publishers of this topic. Decentralising economic activities reveals strategic and political issues to revitalise territory. To tackle the attractiveness of regional spaces in the country, the issue does not only deal with traditional transport methods but also with connectivity issues. Regional publications in the press reveal the politics of infrastructures that will enable teleworking activities.

IV. Conclusion and discussion

Analysing academic literature, French blogs and press publications on the subject "dematerialization and environment" has allowed the discovery a big change described as a "new life" that is emerging. This major social trend is mainly characterised in academic publications with combinations of

words around teleworkers life in the sentences: "daily life", "working life", "life balance", "quality of life".

Indeed, from the academic publications overview maps, 3 main phases emerge from the analysis: the premises at the end of the 20th century, the paradoxes in the early years of the 21st century and the structuring phase of the practices in the second decade of the 21st century.

One interpretation of this thematic landscape can be understood as a voyage through the data which has been compared between blogs and French newspapers publications. If academic literature mainly focuses on structural trends, blogs and newspapers publication primarily mention cyclical and socio-economic factors on teleworking development (e.g transport disturbance due to strikes, bad weather or health risks during the flu epidemic). In this case, the environment is understood as a socio-professional context in favour of teleworking related activities that have a major benefit for natural environment.

Mainly in blogs and press publications, the teleworker is considered as a user who choose his own software tools to obtain freedom from IT departments. The consequences in terms of transport are rather beneficial for the environment, even if academic publications mention new environmental impacts as consequences of teleworking related activities. Furthermore, with the regional press, one can discover the political aspects of teleworking activities for the attractiveness of regional territories. The "third places", does not only mean a new place of coworking space between home and the works building but also includes sites that are congenial to work in such as restaurants, bars etc.

Finally, this paper does not only present a dynamic state of the art but also a heuristic framework to enable collaborations among heterogeneous networks of experts. Maps enable a reflexive interpretation of what is going on at the intersections of each field. After the interview step with experts, consultants, scientists an practitioners, it is worth underlining that complex interactions between each field of expertise, i.e. interactions between sub parts of the map, are highlighted. In this experimental ecosystem, there is also the possibility of a relatively comprehensive synthesis that exceeds the borders of each expertise individually. Indeed, from the academic papers, at the middle level, one interpretation can be carried out on the subject "Dematerialization and Environment".

Then, the mapping and collaboration process permits the point of view of each expert individually to be changed, a map of field interactions to be rebuilt leading to the undertaking of another classification, which would enable future collaborations.

In further research, a comparison with other countries focusing on local implementations of global interactions of telework through blog and press specific language extraction could enable an empirical watch on telework diffusion. Such methodology should become easier with open data to maximize crowdsourcing of feedbacks.

V. Acknowledgements

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