From individual scientific visibility to collective competencies : the example of an academic department in social science

Roger Coronini, Vincent Mangematin

FROM INDIVIDUAL SCIENTIFIC VISIBILITY TO COLLECTIVE COMPETENCIES : THE EXAMPLE OF AN ACADEMIC DEPARTMENT IN THE SOCIAL SCIENCES[1]

R. Coronini[¤], Vincent Mangematin[#]

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Summary

The article discusses the role of university department in social sciences. It studies how to describe the three missions of university department: education, research and consultancy services for public and private organisations. It also proposes tools to evaluate to what extend these missions are connected. Until now, evaluation in this domain has focused primarily on research activities and far too few indicators have been developed for the other two missions. Moreover, evaluation is often performed on an individual basis, so that the synergy generated by work collectives is rarely evaluated.
The purpose of this article is to propose a method for identifying and describing the competencies of a social science research and teaching department. By means of this method can be used to study the articulation between the department's different activities—research, expertise and teaching—can be studied. Maps of an activity are generated, which can serve as a basis for strategic planning of future trends.
The approach is based on an analysis of "traces" (articles, contracts, research reports, post-graduate training modules) of the activity of the different components of the Social Science Department, using lexicographic analysis tools. With keywords, titles, summaries and synopses of lectures, it is possible to draw up "maps" representing the department's main competencies.

During the 90's, OCDE countries have paid more and more attention to higher education policy. Human capital is becoming the key economic resources and universities are the main tools to train students. At the same time, policy makers try to improve the quality of higher education and to limit public expenditures (OECD, 1997).

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¤ IREPD, UPMF, 38040 Grenoble cedex 9, tel : 33 4 76 82 54 89, fax : 33 4 76 82 59 89, E-mail : Roger.Coronini@upmf-grenoble.fr
INRA/SERD, UPMF, 38040 Grenoble cedex 9, tel 33 4 76 82 56 86, fax : 33 4 76 82 54 55 ; E-mail : vincent@grenoble.inra.fr

The efficiency constrains induces new ways of organisation, in which research, higher education and expertise (consultancy) are more connected (Lémelin, 1998). How can the activities of university and research departments be described? How can the division of work within a teaching and research department be analysed? How can the coherence of all a university department's activities be evaluated? The aim of this article is to propose a method for describing the activities and the coherence of these activities at the university department level. Method is validated by means of a specific example: a social science department in a state university in France.

University departments have three missions: education, research and consultancy. While scientometric studies account for researchers' academic visibility, classical tools and data bases used to identify research work are not as successful in describing the competencies of a collective of social science researchers involved in providing expertise and training and in carrying out research. The distribution of work between the three activities (consultancy, lecturing and research) often differs from one laboratory to another. The different tasks may be divided among individuals or, alternatively, each individual may do some lecturing, some research and some consulting; lecturer-researchers may be more or less specialised in one of these activities. Thus, the tools used to measure individual production do not adequately account for the collective competencies of a whole university department.

In the framework of strategic reflection, a joint research project was launched with the social science department (SSD) to describe its competencies[2] in terms of teaching, consultancy and research, as well as the articulation between these different dimensions. The mission of a teaching and research department is to produce certified knowledge (articles), graduates (through courses with a set syllabus), and expertise (research contracts and reports). To achieve these objectives, the department relies on a body of staff (researchers, lecturer-researchers, technicians and administrative staff) who belongs to university. Since the researchers' aim is to nurture creativity[3], their projects naturally develop in diverse directions, with each component taking a different path. Having an overview of these activities and sharing it is therefore a difficult exercise. Yet it is necessary if the synergy within a community is to be enhanced. Apart from the differing theoretical standpoints and areas of specific expertise, it is useful to define more clearly the common features of researchers in a single department. This is necessary for implementing a scientific policy aimed at developing several poles of competence clearly identified from the outside (Nederhof and Meijer, 1995). Such a goal can be reached thanks to an audit

2 A complete definition is provided in the following pages. In short, the competencies of a teaching and research department are identified by the fields in which the SS department can propose an articulated offering comprising teaching, expertise and research.

of the department. But it is costly and it has been learnt from Scientometrics that it is possible to get an idea of the activities of an university department and of the coherence amongst its activities by analysing the production of the department.

By analysing the "traces" (articles, contracts, research reports, post-graduate teaching modules) of the activity of the different components of the SS department, by means of lexicographic analysis tools, it is possible to draw up "maps" representing the department's main competencies.

Three objectives guide this research:

- Designing a method for identifying and describing the competencies of a group of social science lecturer-researchers;
- Developing a method for studying the articulation between the different research, consultancy and teaching activities of the SS department;
- Proposing maps of the activity, on which strategic reflection can be based for defining future trends.

Shifting the focus from an individual's academic production to the competencies of a collective requires more than the description and classification of publications referenced in databases. It is necessary to define the notion of competence and to give it an empirical content. To grasp the multiple dimensions of competence, we suggest using written texts (articles, reports, lectures, etc.) representing interaction with the department's "partners" (economic actors, students, peers) (first part). The method and data are then described (second part), the competencies and complementarities between the different basic activities (research, teaching, consultancy) outlined (third part), and the elements of a strategic diagnosis proposed (fourth part).

1. FROM INDIVIDUAL SCIENTIFIC PRODUCTIVITY TO COLLECTIVE COMPETENCE

Since the seminal work of Narin, Van Raan, Nederhof and Moed, the scientific productivity of universities has often been measured in terms of the number and the quality of publications. The data bases used are often those of the ISI[4], especially for life and experimental sciences (Bruin de, *et al.*, 1993). The aim of such studies is to compare the different teams and to define strategic orientations in terms of a single dimension: research. Although such approaches are relevant for the study of research organisations or for the analysis of collaboration (Glanzel and de Lange, 1997), they cannot be used as they are for describing the activities of universities, split into three areas: education, research and

3 To lighten the text, the term "researcher" will be taken to mean all staff engaged in research work, especially researchers, lecturing researchers and engineers.

consultancy. Scientometrics have to be adapted to be able to describe activities of university department and the coherence amongst these activities. Efficiency of university department is closely related to the coherence of activities which represents each missions of universities. Several authors have argued in favour of the use of a method for globally analysing universities' activities:

1. In the framework of global reflection on the information of universities' work, Dubois and Gueissaz (1994) show that the university can be seen as a productive organisation of students and research. These authors emphasise the dual dimension of the profession of lecturer-researcher.
2. Based on a study of the university/industry research contracts in the United States, Mansfield (1995) shows how the different dimensions of a university's activities (education, consultancy, and research) can cross-fertilise one another. Consultancy can be initiated through lecturers supervising students during practical training in enterprise, or through networks of former students. The mutual satisfaction of the firm and the university may result in the definition of common research goals.
3. By analysing the research contracts between industry and an applied research organisation, Joly and Mangematin (1996) show that scientific activity can be analysed in terms of several logics based on different dynamics. A "proximity" logic will aim at supporting the innovation of a specific industrial sector, whereas a "market" logic aims at advancing scientific knowledge since the partners have enough internal competence to turn scientific progress into an innovation. The type of scientific production will differ, depending on the logic adopted by the laboratory.

The shift from an analysis of individual scientific production in life and experimental science, to the study of the competencies of a social science teaching and research department is not immediate. First, the quality of the databases available for analysing scientific production in the social sciences is lower than that for sciences. Secondly, the introduction of an analysis focused on three dimensions often implies the existence of research collectives in which work is divided. Thirdly, competence cannot be assessed intrinsically. It must be defined in relation to partners.

Problems in monitoring scientific production in the social sciences

De Looze *et al.* (1996) point out that the social sciences have two important characteristics: the language of publication is generally the mother tongue of the author even though English tends to dominate, and there is a multiplicity of media due to the fact that written texts provide researchers in this field with most of their food for thought. The methods used to study scientific production therefore have little relevance for the social sciences (Nederhof *et al.*, 1989). Data bases offer a limited coverage

4 Tijssen and van Leeuwen clearly show the existing discrepancies between the ISI bases and other bases, and the consequences of these differences on the measurement of production (Tijssen and Van Leeuwen, 1995).

of applied scientific, technical or professional journals, are biased in favour of English-language journals (particularly from the USA) and include very few new scientific reviews (particularly in specialised, rapidly developing fields) (de Looze *et al*., 1997).

A division of work

Many signs (Joly, 1997) point to the growing importance, globally, of collective production. P. Stephan (1996) shows that the average number of authors of an article in a journal indexed by the *Science Citation Index* rose from 2,52 in 1979 to 3,50 in 1993 and that scientists working together produce more, of a higher quality, than those working alone. One of the hypotheses used to explain the significance of research collectives both in academic production and in all dimensions of scientific activity (education, consultancy and research) relates to the necessary division of work within teams. Taking the research compass card method (Larédo *et al*., 1992), Larédo and Mustar (1996) point out that a single laboratory can be involved in a small number of activities only: less than two main activities and less than one complementary activity.

The three dimensions of scientific activity, inaccessible to isolated individuals, require the existence of an organised research collective. The productivity of the group depends on the quality of the organisation (Weisenburger and Mangematin, 1995). Scientific production does not depend only on individual production but on the distribution of work between the various participants. This distribution of work implies a distribution of knowledge within the collective (Arora and Gambardella, 1994). It may go hand in hand with a specialisation of tasks in one of the three dimensions or, on the contrary, be based on a high degree of versatility of the individuals. Analysing only the "research" dimension does not enable one to investigate the coherence of the three types of activity. On the other hand, reasoning in terms of individuals is likely to produce a biased image of a research group's activity if all its members do not participate in all the activities. For a single group, the perception one has of the coherence of activities will be different if the division of work is based on a separation of tasks between teaching, research and consultancy, and if it is based on the versatility of individuals. We have therefore chosen to reason in terms of research groups, identified by their institutional affiliation.

Understanding competence « in context »

Competence is defined as the capacity of an organisation or an individual to do something. Thus, competence should not be confused with the results of an action; it represents a capacity. Here, we define the competence of a university department as its capacity to propose an articulated offering of

teaching, expertise and research. The general competence of university departments (providing high quality under- and post-graduate training) is not covered. Only the specific competencies of the SSD department are considered.

Both individual and collective competencies are difficult to perceive intrinsically. Competencies are assessed in a situation (research, teaching, and consultancy), in relation to a variety of partners. The ability to write in French will not be assessed in the same way if one is considering a group of illiterate people or members of the Académie Française.

Understanding competence in interaction is a difficult exercise. F. Eymard Duvernay and E. Marchal (Eymard Duvernay and Marchal, 1997) successfully attempted to do so, by analysing recruiters' skills applied during recruitment. In this case, the situation and even the protagonists are clearly identified. However, when neither the protagonists in the relationship nor the framework of the relationship are identified—e.g. when people (colleagues, industrial partners, public authorities, students, etc.) who have relations with a training and research department or a university identify its competencies—the approach has to be adapted. Universities make contact with the outside world through their writings and presentations (books, articles, conference papers, reports and course syllabuses). These activities leave traces of relations with a wide variety of actors in the outside world. The scientific community is not the only interlocutor of researchers engaged in partnerships with private partners (businesses, local, regional, national and international elected representatives) and in teaching activities.

Assuming that a communication medium is primarily intended for a type of "partner", one can use lexicographic programs on different databases. Each database will allow one to identify the competence perceived by a type of actor (colleagues, students or socio-economic partners). Thus, the scientific publications database (books, contributions to books, articles in scientific journals) describes the competence perceived within the academic community. The database of popularised reports and articles describes that which is perceived by the socio-economic partners (businesses, unions, public authorities, associations, etc.) of the SS department. Lastly, the course syllabus describes the competence perceived by the students.

For education, two levels can be defined: the areas for which the teaching and research department has recognised competence in terms of expertise, and those for which competencies in terms of research are identified. Very roughly, PhD training should correspond to the themes in which research competence is clearly visible. PhD students expect researchers to be able to accompany them, in their training, by doing research. For Masters degrees, one of the key variables is knowing whether the lecturing researchers accompanying the students in their specialisation are themselves recognised as specialists in their field.

PhDs and Masters degrees are of course not the only forms of training. They are, however, the most closely connected to research and consultancy, and are the degrees for which the laboratories' specific competencies in particular research domains count the most.

Competencies used to convince firms or public authorities, whether at a regional or European level, are different. Firms are keenly interested in a researcher's level of expertise and her/his knowledge of the sector, for that is what conditions the relevance of her/his diagnoses and analyses. Public authorities focus essentially on research, which helps them to define the most appropriate, scientifically grounded, public policy.

Like P. Dubois, we suggest considering the teaching and research department as though it were a productive organisation. The university's production is aimed at a varied public, colleagues of the academic community, lecturers and socio-economic partners. Recent analyses of the different scientific domains have shown that the various dimensions of researchers' activities could be mutually enriching. Understanding how these dimensions link up to constitute the competencies of the SS department is the main purpose of this article. Coherence between these dimensions conditions efficiency of University department and their visibility outside academia. The method used is inspired by work carried out in other areas (Estadès and Delooze, 1998; Joly and Mangematin, 1996) and applied to the social sciences. The articulation of the different dimensions of researchers' work involves the constitution of a collective in which the competencies are shared and valorised. That is why the analysis describes the collective rather than individual competencies of the research units, i.e. the laboratories.

2. THE SS TEACHING AND RESEARCH DEPARTMENT: PRESENTATION AND METHOD

The SSD department comprises research laboratories specialised in four complementary fields: applied economics, innovation economics, energy economics and industrial sociology. These four specialities are developed in four labs : Applied Economics Lab (AEL), Innovation Economics Lab (IEL), Energy Economics Lab (EEL), and Industrial Sociology Lab (ISL). Some researchers do not belong to any lab. They are grouped in a notional called “Other”, (OL). The laboratories are grouped together within the SSD university department. Our analysis covered the period 1993-96; data for 1997 were not available when the study was done. The picture that emerged from the writings (articles, reports, books, course syllabuses, etc.) related back to work carried out between 1991 and 1994, since a lapse of at least two years is necessary before the research is finalised and its results published in scientific journals. Teaching data is not subjected to the same time constraint.

Between 1993 and 1996, the teaching and research department consisted of 159 persons (lecturer-researchers, researchers, PhD students or non-statutory staff) who had worked on at least one document recorded in the laboratory publications data base (created for this research) or had given at least one

lecture (14 lecturer-researchers had not published). All the SS department's publications in 1993-96 amount to 967 documents of various kinds. 130 references to working documents were eliminated. Table 1 describes the nature of the documents used to construct the themes of the SS department.

Table 1 : Nature of documents published by staff of the SS department

Type of document	No.	Percentage
Contributions to a book	125	15,0%
Books	28	3,3%
Foreign scientific journals [5]	55	6,6%
French scientific journals	89	10,6%
Total scientific publications	297	35,5%
Articles in a popularised journal or in a professional and technical journal	148	17,7%
Research reports	143	17,1%
Total documents related to expertise	291	34,8%
Papers	249	29,7%
Total	837	100,0%

Table 2 presents the contribution of each component of scientific production. The lecturer-researchers who are not part of a laboratory are considered as belonging to a fictive entity, called "others".

Table 2 : Average publications by type of document and by team, over a four-year period (1993-96)

	Staff	Books and contributions	Scientific journal	Papers	Reports and popularisation
ISL	12	1,0	1,2	1,8	2,5
EEL	29	0,4	1,0	3,0	3,0
IEL	23	0,7	1,3	1,6	1,4
AEL	59	1,7	1,0	1,3	1,7
OL	22	0,5	0,5	1,2	1,7
Total	145	1,1	1,0	1,7	2,0

Globally, the number of scientific publications per year and per person is low compared to the popularised reports and articles. Table 2 also reveals the different publications practices among laboratories. The "applied economics" laboratory seems to have preferred books and contributions to books (see Annex 2 for raw figures) whereas the "industrial sociology" and "innovation economics" laboratories prefer articles in scientific journals. Differences in the number of papers are primarily due to differing practices as regards the collection and archiving of the laboratories' papers. They must be treated with caution. Finally, the production of the different laboratories seems to tend towards the writing of popularised reports and articles rather than towards peer-validated scientific production.

5 A scientific journal is a journal that publishes articles validated by peers (reading committee and referees).

The "teaching" corpus was compiled from the post-graduate (Masters and PhD) brochures. It uses the same names, volumes (number of hours) and lecturers of these courses.
Table 3 shows the contribution of each team in Masters and PhD training. To homogenise the presentation, all the courses are standardised at 20 hours.

Table 3 : participation of each team in Masters et PhD training

	ISL	EEL	IEL	AEL	OL	Total
Number of classes	8	7	5	33	36	89

To define the themes on which the SS department researchers work, we have used lexicographic treatment (detailed in annex 3) on four data bases defined as follows:

- Scientific publications (articles, books and contributions to books);
- Documents related to expertise (reports and articles in popularised journals or professional and technical journals);

Papers, representing emerging fields, for which the publications have not yet been accepted.
Teaching, PhD or Masters courses (a course = 20 hours).
Treatment carried out on these four bases enable us show the themes on which SS department researchers were working between 1991 and 1995.

3. RESULTS: COMPETENCIES OF THE SS DEPARTMENT AND COMPLEMENTARITY OF ACTIVITIES

Based on the indexing of the titles (or keywords) of all the documents present in each of the databases, the Sampler program proposes "clusters" (detailed in Annex 3). The constitution of clusters is based on the measurement of co-occurrence of words indexed in each of the bases. Manual treatment is then required to eliminate those clusters which have no meaning (polytomie of a term, for example) and to group together clusters based on a common logic (synonymy for example). This is a tricky step because it requires an in-depth study of each map for analysing the coherence of the groups. The definition of the SS department's competencies is based on these groupings (presence of research work, of expertise and teaching possibilities).

SS department's competencies

The table presents a map of competencies on the different themes, as shown on the lexicographic maps we drew up on the basis of the different corpuses, publications, conference papers, reports and articles in popularised journals, and teaching courses.

Table 4 : the themes where lecturer-researchers are present

	Publication	conference	Report	Teaching	Teaching	Labs				
Themes				PhD	Master	ISL	EEL	IEL	AEL	OL
Economic theory	26	50	5	8	6					
Training, qualification	13	0	10	1	0					
Job market, wage ratio, trade union activity	46	4	24	4	21					
Territory and development	115	27	51	3	12					
Biodiversity, environment, agri-environmental measures	0	57	23	1	1					
Institution	35	27	29	1	7					
Energy, monopoly, regulations, prices	21	36	73	7	0					
Museology, linguistics	4	10	13	0	0					
Strategy and partnerships	90	57	106	2	9					
Research, innovation, scientific policy	89	57	63	2	5					
Health and cost-benefit analysis	16	0	16	0	0					

For teaching, the basic unit is a course (20h)

Key

Laboratory which contributes the most (max)
Laboratory which contributes significantly (average – a typical gap)

Technical comments
- the sums are greater than the total number of publications because some publications count in two clusters;
- papers are not listed as fully as articles or reports. They are not as well indexed and laboratories' policies on the establishment of lists of papers vary.

The lines show the themes which are based on clusters resulting from lexicographic treatment. A description of the themes is provided in the box below. The columns present the clusters resulting from lexicographic treatment, by corpus (papers, publications, reports and courses), and the research laboratories working on the theme. This table is completed by the qualitative information on the clusters grouped together in Annex 3.

Description of the selected themes

1. Economic theory: This theme groups together two main types of work: contributions to decision-making theory and choices under uncertainty and experimental economics. Evolutionary theory is not part of the theme because it does not appear independently from work on innovation during the period.

2. Training: This theme covers all the research performed on the educational system, as well as the training supply and demand.

3. Job market, wage ratio and trade union activity: this theme covers all the contributions on the functioning of the internal and external labour market. It includes work on the role of trade unions, on wage negotiations and collective bargaining, and on the setting of wages.

4. Territory and development: this theme groups together all contributions on local development, the spatial distribution of activities and industrialisation (in developing countries, newly industrialised countries and countries requiring modernisation).

5. Biodiversity, environment, agri-environmental measures: this theme groups together two types of research: that carried out on biodiversity, based primarily on an economic analysis of the value of the natural heritage, using contract theory, and that carried out in collaboration with other disciplines for analysing different options for valorising the natural heritage (anti-pollution measures, etc.).

6. Institution: this theme describes three types of contribution: (1) on the role of the State as a regulating agent, particularly in developing countries and on the job market; (2) on the role of the State in the common agricultural policy; (3) on the functions of the State in the co-ordination of activities (research, innovation, spatial distribution of activities).

7. Energy, monopoly, regulations, prices: this theme groups together all the contributions relating to energy problems. In particular, these concern a study of competition, of regulations and of restructuring in the energy sector.

8. Museology: This theme describes a homogeneous set of contributions, based on an analysis of discourse and texts for evaluating exhibitions. The scientific contributions are in semiology.

9. Partnerships: this theme groups together analyses of partnerships formed within the SS department: inter-enterprise partnerships, management of projects between firms, public-private partnerships. This work contributes to research on corporate theory, contract theory and organisation theory.

10. Research, innovation and scientific policy: this theme covers three types of contribution: the first type relates to research policy, the dynamics of innovation and economic analysis of technical progress (especially evolutionary theory). The second type concerns fields of analysis (nitrogen, plant genetics). The third describes tools, especially competitive intelligence and scientometrics.

11. Health and cost-benefit analysis: this theme groups together two types of contribution. The first is focused on hospitals, with an approach in terms of public management. The second is oriented towards a cost-benefit analysis of drugs. This theme covers several contributions in Energy Economics, on cost-benefit analysis methods.

Lexicographical processing of the data reveals eleven themes which may be identified by the different actors in relation to the teaching and research department. Although the image of the SS department

may seem fragmented, the fact remains that all the researchers, each in their own field, are connected to their scientific community. Almost half the documents include an outside person, as Table 5 shows.

Table 5 : Collaboration with the outside

Laboratories	Outside collaboration	Number of documents	Degree of openness
ISL	52	78	67%
EEL	32	216	15%
IEL	110	116	95%
AEL	173	340	51%
OL	4	87	5%
Total	371	837	44%

The degree of openness indicates the proportion of authors outside the department in the total number of recorded documents.

Well linked to its socio-economic partners, the SS department nevertheless has trouble finding a theoretical framework for valorising empirical work and for nurturing collective accumulation, as the relatively low level of publication attests.

Apart from relations maintained with each type of partner, we need to investigate the synergies developed by the laboratories for each theme. Although it may be easy to find unity in essentially theoretical research guided by theoretical problems identified in the literature, it is difficult to define common trends when the research is induced by questions asked by the socio-economic partners.

Complementarity of activities

The implicit hypothesis underlying Mansfield's article (Mansfield, 1995) is that there is synergy between the different activities (expertise, scientific production and teaching). Yet, for such synergy to exist, the implications and the recognition of each of these activities have to correspond.

To describe the place of each of the themes in relation to one another, we have chosen to reason in relation to the average. The implicit hypothesis is not to propose a nominal measurement of synergy between the activities, but rather to establish a classification. If an activity has a strong presence on a scientific level, it would be normal for it to be taught in PhD training, and to generate relations with socio-economic partners. Similarly, it seems logical that the competence acquired during relations concerning expertise, should be taught in a Masters course.

Table 6 : Index of specialisation by theme and by activity

	Research	Expertise	PhD course	Ms course	Paper
Economic theory	0,63	0,13	3,08	1,05	1,79
Training	0,32	0,26	0,38	0,00	0,00
Job market	1,12	0,63	1,54	3,79	0,14
Territory	2,80	1,34	1,23	2,13	0,96
Environment	0,00	0,61	0,35	0,18	2,04
Institution	0,85	0,76	0,35	1,18	0,96
Energy	0,51	1,92	2,69	0,00	1,29
Museology	0,10	0,34	0,00	0,00	0,36
Partnership	2,20	2,79	0,77	1,70	2,04
Innovation	2,17	1,66	0,58	0,94	1,61
Health	0,39	0,42	0,00	0,00	0,00
Reference	1,00	1,00	1,00	1,00	1,00

Method for drawing up Table 6:

A reference theme of research and teaching is defined as the "average" theme in each of the activities (expertise, teaching and research). In this theme, the connection between activities is average. We then evaluate for each theme its position in relation to the average theme, that is to say, the theme corresponding to an average between teaching, research and expertise. Thus, for theme i, we define the index R_i for research, E_i for expertise, A_i for PhD teaching and S_i for Masters teaching, in the following way:

$$R_i = \frac{R_i - \overline{R}}{\overline{R}} + 1;$$

Table 6 allows us to conclude, for example, that competencies in the fields training, territory, environment or institution are valorised in a coherent way in the social sciences department. At the contrary, researches and expertise in the fields partnership analysis, innovation, museology and health are not valorised in teaching while teaching has a predominant place for job market, economic theory and energy.

This table offers elements of an answer to two questions:

What coherence is there between the three dimensions of the SS department's activity?

What is the heart of the SS department's competencies?

Coherence between the three dimensions of scientific activity in the SS department

Coherence is analysed in relation to two dimensions: internal coherence in the themes between teaching, expertise and research, at the SS department level and at the laboratory level.

The classification of themes shown in table 7

Table 7 : Coherence at the department level

Coherence	Themes which are not or are hardly valorised in teaching	Themes for which a balance is reached	Themes for which teaching has a predominant place
Themes	Museology; Partnerships; Innovation; Health.	Training; Territory, although the scientific competence is valorised mainly in Ms courses; Environment; Institution.	Job market; Economic theory Energy.

The diagnostic enlightens that the coherence between each theme of expertise, research and teaching is not perfect if the department is taken as a whole. The distortions show that the choices of specialities taught are partly unrelated to the other activities of the SS department. The department does not systematically reflect the scientific visibility or the expertise of its members in its teaching themes. The strategic plans of the department have to reinforce the connection between postgraduate teaching and research in four themes. Moreover, it could be dangerous to keep high volume of postgraduate teaching in themes in which neither research nor expertise is well recognised outside the department. Table 7 clearly identifies the zones in which the management of the department has to react.

The coherence of laboratories' activities

Taken at the department level, the analysis of the coherence of activities shows that coherence can be improved. Ways of improvements can be drawn in two different directions :

- analysing the core competencies of the department
- analysing more deeply the connection between teaching and research by examining the matching between labs and participation of teaching.

Table 7 summarises the situation. It relates themes of research, post graduate teaching and labs. The core competencies of the department are defined as themes in which several labs are participating. Thus, table 8 points out the number of labs which participate to each theme.

Globally, 23 post-graduate courses are taught in themes in which only one lab is participating, 27 on themes in which 2 labs are participating and 39 are taught in the core competencies of the department.

Table 8 : Coherence of research and teaching activities

	Labs by order of contribution	Contributions, publications and papers	Number of post-graduate courses
Themes in which one lab is participating	Training Museology Energy Territory	AEL OL EEL AEL	1 (AEL) 0 7 (EEL, OL) 15 (AEL, OL)
Themes in which two labs are participating	Health Environment Job market	AEL, OL IEL, AEL AEL, ISL	0 2 (IEL, EEL) 25 (AEL, OL)
Themes in the core competencies	Innovation Partnerships Economic theory Institution	IEL, AEL, ISL, EEL AEL, IEL, ISL, EEL AEL, IEL, ISL, EEL AEL, IEL, EEL	6 (IEL, AEL, EEL, OL)) 11 (AEL, ISL, OL) 14 (AEL, IEL, EEL) 7 (AEL, OL)

This table calls for three remarks:

- Two themes are not taught: health and museology. As such, these themes may seem peripheral. On the other hand, each of them could be part of training on the role of the state and the organisation of economic activities considered as public goods.
- Four themes are coherent as regards the members of the laboratories working on them: training, territory, environment and energy. Although the themes "training" and "environment" have an equivalent weight in scientific production and teaching, it seems that the situation is radically different for "territory" and "energy". Could the predominant place of lecturer-researchers be an explanation? Or is the explanation more likely to be historical?
- Five themes show differences between teaching and research.

"Economic theory" is primarily taught by the AEL (Applied economics laboratory), so all the laboratories participate in this theme.

The ISL and AEL share scientific production of the "job market" theme, while only AEL teaches it in post-graduate courses.

The theme "Institution" is at the core of the SS department's competencies. As such, this theme is the subject of few theoretical contributions and courses; these are provided by Applied economics;

"Innovation" and "partnership" are important themes for all the laboratories. Their place in post-graduate teaching is reduced.

A detailed analysis of the articulation between teaching, expertise and research reveals significant discrepancies between research and teaching. The research laboratories (except for AEL) limit their teaching to their speciality (energy, environment, and innovation) whereas AEL offers a wide range of courses, both specialised and of a general nature.

The core of the SS department's competencies

A comparison of tables 4 and 6 enables us to pinpoint the themes on which the SS department can base its development if the aim is to reach a critical size and to benefit from cross-fertilisation between the different laboratories belonging to it.

- Four themes are worked on by one research group only: training, museology, energy and territory. The clusters (publications) used to constitute these groups have weak external links (Annex 2), which reflects isolation of the theme which functions autonomously compared to the other themes of the SS department. It is difficult to rely on these themes for stimulating collective research within the SS department.
- Three themes shared by two research teams: health (cost-benefit method used in health and in the energy sector), labour market (work on trade unions, working conditions and the labour market at AEL and ISL) and the environment (IEL and EEL). The external links of the clusters constituting the "health" theme are weak, reflecting the isolation of the theme. On the other hand, they are stronger for the clusters trade unionism and employment which structure the "labour market" theme. This theme does not emerge in publications, and papers represent less advances stages of research, during which arguments still need to be refined. Only the "labour market" theme appears to correspond to competence in the SS department.
- Four themes are shared by more than three teams: innovation (ISL, IEL, AEL and, to a lesser extent, EEL), partnerships (the same laboratories), economic theory and institution. These four themes constitute the core of the SS department's competence. The clusters constituting the "innovation" theme show strong external links, which means that the treatment of innovative processes is at the centre of a lot of work. The same applies to institution. Partnership appears to be a more specific theme, for which the outside links remain weak. By nature and by construction, the economic theory theme is transversal.

The themes which constitute the core of SS competencies describe work on the organisation of economic activities, inter-firm co-operation, public-enterprise organisation, and innovative activities. Whereas many contributions study the role of the state in various situations (common agricultural policy, partnerships, energy policy, local co-ordination of activities, public management, training policy, etc.), theoretical reflection (other than regulation theory) is still at a very early stage. Teaching takes very little advantage of the numerous advantages of the SS department in this domain. Industry does not seem to be common group for researchers in the SS department. Shared competencies primarily concern the co-ordination of activities and the role of the state.

CONCLUSION

Three main points have to be mentioned in the conclusion. First of all, the example demonstrates that it is possible to map competencies of university department without a complete audit. Taking all written production (articles, papers, syllabus of courses, reports on contracts, etc.) and using lexicographic tools offer a description of activities of the university department as well as its degree of visibility by each "client" of the department : economics and politic actors, students and academic community. Moreover, the method gives information about the coherence of each dimension of the activities, by labs and for the department as a whole.

Second, the method can be used for strategic purposes. Core competencies of the department and weaknesses are identified not only at the lab level but also at the department level. Incentives to reinforce core competencies can be given to the different labs to create a higher visibility of the department activities. Management can adopt specific arrangements to reduce weaknesses. Courses are the key variable in that framework. In that way, efficiency can be reinforced.

Thirdly, this paper enlightens the division of work at the lab level between expertise, teaching and research. The lab seems to be the good level of analysis of the division of work. More research still has to be done to test the efficiency of the different modes of organisation : repartition of each activity on each individual or specialisation of individual by activities. It is what we expect to do in engineer science.

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Annex 1 : Contribution of each lab to each theme

Table 1 : Publications

Clusters	Articles	Collab	ISL	EEL	IEL	AEL	OL
Economic theory	26	43	19,2%	3,8%	30,8%	46,2%	0,0%
Training	13	22	0,0%	0,0%	0,0%	92,3%	7,7%
Job Market	46	68	26,1%	0,0%	0,0%	73,9%	0,0%
Territory	115	179	2,6%	6,1%	0,0%	84,3%	7,0%
Environment	0	0	0,0%	0,0%	0,0%	0,0%	0,0%
Institution	35	55	0,0%	8,6%	20,0%	71,4%	0,0%
Energy	21	33	0,0%	90,5%	4,8%	4,8%	0,0%
Museology	4	7	0,0%	0,0%	0,0%	0,0%	100,0%
Partnership	90	142	13,3%	7,8%	27,8%	46,7%	4,4%
Innovation	89	165	7,9%	1,1%	53,9%	31,5%	1,1%
Health	16	20	6,3%	37,5%	0,0%	31,3%	25,0%

Table 2 : Conferences

Clusters	Confer	Collab	ISL	EEL	IEL	AEL	OL
Economic theory	50	89	8,0%	14,0%	36,0%	40,0%	2,0%
Training	0		0,0%	0,0%	0,0%	0,0%	0,0%
Job Market	4	6	0,0%	0,0%	0,0%	100,0%	0,0%
Territory	27	37	0,0%	3,7%	0,0%	77,8%	18,5%
Environment	57	102	0,0%	35,1%	59,6%	1,8%	3,5%
Institution	27	37	0,0%	11,1%	18,5%	70,4%	0,0%
Energy	36	40	0,0%	100,0%	0,0%	0,0%	0,0%
Museology	10	11	0,0%	0,0%	0,0%	0,0%	100,0%
Partnership	57	89	15,8%	3,5%	24,6%	52,6%	3,5%
Innovation	45	75	24,4%	17,8%	31,1%	24,4%	2,2%
Health	0		0,0%	0,0%	0,0%	0,0%	0,0%

Table 3 : Reports

Clusters	Reports	Collab	ISL	EEL	IEL	AEL	OL
Economic theory	5		0,0%	0,0%	0,0%	0,0%	100,0%
Training	10	33	0,0%	0,0%	0,0%	100,0%	0,0%
Job Market	24		37,5%	4,2%	0,0%	8,3%	50,0%
Territory	51		2,0%	0,0%	0,0%	88,2%	9,8%
Environment	23		8,7%	47,8%	34,8%	0,0%	8,7%
Institution	29	37	6,9%	34,5%	34,5%	24,1%	0,0%
Energy	73		0,0%	80,8%	5,5%	13,7%	0,0%
Museology	13	15	0,0%	0,0%	0,0%	0,0%	100,0%
Partnership	106		34,0%	12,3%	17,9%	34,0%	1,9%
Innovation	63		27,0%	7,9%	38,1%	22,2%	4,8%
Health	16	41	0,0%	18,8%	0,0%	81,3%	0,0%

Table 4 : Teaching

Clusters	Teaching	ISL	EEL	IEL	AEL	OL
Economic theory	14	0,0%	7,1%	7,1%	78,6%	7,1%
Training	1	0,0%	0,0%	0,0%	100,0%	0,0%
Job Market	25	0,0%	0,0%	0,0%	24,0%	76,0%
Territory	15	0,0%	0,0%	0,0%	20,0%	80,0%
Environment	2	0,0%	50,0%	50,0%	0,0%	0,0%
Institution	8	0,0%	0,0%	0,0%	75,0%	25,0%
Energy	7	0,0%	85,7%	0,0%	0,0%	14,3%
Museology	0	0,0%	0,0%	0,0%	0,0%	0,0%
Partnership	11	45,5%	0,0%	0,0%	36,4%	18,2%
Innovation	6	33,3%	0,0%	33,3%	16,7%	16,7%
Health	0	0,0%	0,0%	0,0%	0,0%	0,0%

Annex 2 : List des clusters

Table 2.1 : List of clusters for “Conferences” (2 cooccurrences)

CLUSTER	NMOT	LINT	LEXT	SATUR	SEUIL	N°
Salaire	3	2	0		0.499995	1
Media	6	6	0		0.266664	2
Innovation	10	11	5	s	0.199998	3
Iaa	10	16	5	s	0.112499	4
politique agricole	6	8	3	s	0.111110	5
Biodiversité	7	9	2	s	0.099999	6
Prime	9	17	5	s	0.088888	7
Information	8	9	2	s	0.076922	8
Subvention	9	18	5	s	0.055555	9
Energie	3	2	2		0.050000	10
Régulation	7	8	2	s	0.047619	11
Environnement	8	7	9	s	0.036363	12
Stratégie	10	13	8	s	0.035714	13
Restructuration	9	12	0		0.030075	14
Modèle	7	11	7	s	0.022222	15
Etat	7	8	7	s	0.019231	16
Territoire	10	10	4	s	0.013468	17

Table 2.2. : List of clusters for “ Publications ” (2 cooccurrences)

CLUSTER	NMOT	LINT	LEXT	SATUR	SEUIL	N°
Norme	3	2	0		0.666660	1
Sémiologie	3	3	0		0.444440	2
Sécurité	6	8	0		0.199998	3
Santé	9	14	2	s	0.166665	4
Sciences	10	12	3	s	0.124999	5
Syndicalisme	10	10	3	s	0.099999	6
Le labo «Sociologie industrielle»logie	6	6	3	s	0.081699	7
Emploi	8	8	8	s	0.069230	8
Formation	6	7	2		0.062936	9
Modernisation	4	3	4		0.058823	10
Génétique végétale	10	16	6	s	0.056818	11
Économie	5	5	1		0.052287	12

Recherche	4	4	4		0.051948	13
Entreprise	6	7	12	s	0.041666	14
Concept	3	2	2		0.038461	15
Marche du travail	3	3	1		0.038095	16
Développement industriel	10	9	4	s	0.037037	17
Politique	5	5	3		0.034188	18
Espace	3	2	3		0.029411	19
Partenariat	10	11	5	s	0.028571	20
Modèle	8	10	3	s	0.027972	21
Énergie	6	10	5	s	0.025641	22
Etat	10	13	10	s	0.015151	23
Innovation	10	9	11	s	0.015151	24
Industrialisation	10	11	5	s	0.012032	25
Institution	9	10	8	s	0.006598	26

Table 2.3 : List of clusters for Reports

CLUSTER	NMOT	LINT	LEXT	SATUR	SEUIL	N°
Intégrales de processus stochastiques	7	20	0	s	0.999990	1
Muséologie	5	9	0		0.199998	2
Azote	10	18	3	s	0.199998	3
Entreprise	9	15	10	s	0.181816	4
Bâtiment	10	11	4	s	0.166665	5
Bibliométrie	7	12	3	s	0.140624	6
Management	4	6	1		0.095237	7
Formation professionnelle	8	11	1		0.095237	8
Reforme	9	8	4	s	0.081632	9
Etat	9	17	5	s	0.080356	10
Nitrate	7	19	3	s	0.071428	11
Innovation	10	11	11	s	0.062068	12
Gestion	10	11	8	s	0.059523	13
Production	7	7	6	s	0.055555	14
Prix	10	12	6	s	0.051136	15
Partenariat	10	12	3	s	0.050000	16
Coût	10	14	3	s	0.047619	17
Technologie	4	3	3		0.035714	18
Environnement	8	9	6	s	0.028571	19
Industrie pétrolière	3	2	3		0.024691	20
Développement local	7	7	3		0.024691	21
Techniques	9	20	3	s	0.023809	22
Modernisation	10	11	5	s	0.020202	23
Emploi	7	7	3	s	0.016666	24
Développement économique	8	12	5	s	0.007663	25

Annex 3 : Method for constituting clusters

The SAMPLER software, a tool for lexico-statistical analysis of textual documents, was used. Our procedure was as follows:

Extraction of samples of texts utilisable for the analysis of data bases on SS department publications. The keywords of the three corpuses have been extracted: for publications, research papers and reports, this extraction was done by means of a data base management program (SGBD Texto). For the teaching corpus, the texts of the various post-graduate and PhD course brochures were used in their entirety.

Based on these documents, the Sampler software makes an initial analysis by breaking down each document into extracts. It is these extracts which serve as a basis for the calculation of co-occurrent words. Most of the time they correspond to a paragraph or a structured note. It then identifies all the words in the text and calculates their respective frequency of occurrence. Words and frequency are again grouped into an index linked to the document. At this stage the index consists of uni-terms only. This filtered list is then completed by multi-terms obtained automatically from the terminological extractor. The index is then controlled and improved. Once the index has been defined, another stage, consisting of identifying co-occurrent terms and forming clusters, starts.

3) The examination of co-occurrences provides the list of co-occurrent terms (two terms are said to be co-occurrent when they appear together in one or more extracts). The terms of this list are then grouped together into a sub-set, depending on the intensity of the relations of co-occurrence linking the terms of the list. The clusters (aggregation of a finite set of co-occurrent words) are thus constituted.

4) When a cycle in the processing has ended, the clusters can be visualized in the form of graphic maps. These then serve to find the extracts which were used to constitute them. The process can be repeated by amending the content of the index or the parameters of co-occurrences.

5) Each of the corpuses was processed in this way: publications, papers, reports and courses. The different maps were examined and grouped together by theme, so as to identify the themes present simultaneously in the corpuses.

Isolated themes, present in a single corpus, were not selected.