

Triple Helix XI Conference:

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Conference theme: *Overall performance of the Triple Helix Approach: From efficiency of factors of production to 'modes of coordination'*

Topic: *The triple helix approach in transformation, including globalisation and societal welfare issues*

Strand A

Is an analysis in terms of social time and management by time a contribution to Triple Helix relations?

Keywords: R&D, academic research, project-based working, analysis of temporalities, Triple Helix interactions.

Jel; O31, O38, H5.

The purpose of the Triple Helix model is to improve understanding of the dynamics generated by the interactions between universities, industry and governments. Thus in the emerging knowledge society, the state and governments are not the sole producers of institutions; rather, universities and firms also produce norms and conventions that influence actors' practices. In order to back up their approach, proponents of this school of thought draw on various sources of quantitative and qualitative data that can be used to explain and/or formalise university-industry-government relations and their consequences for the innovation dynamic of a country, sector or region.

We argue in this paper that this methodological panoply could usefully be extended to include an analysis of social time. The purpose of this approach is to analyse and compare the new norms, some of them time-related, that have become established since the 1990s in both firms and universities as a result of changes in government policy and to investigate their impact on employees' practices. This method should make it possible to capture in detail the dynamic of Triple Helix interactions.

The case investigated in this paper is that of project-based working, which has become widespread in recent years in both industrial and academic research. The purpose of this mode of work organisation is to coordinate, within a limited, constrained and proceduralised period of time, the various functions of the units involved and their workers in order to bring a new 'product' to market. This product may be tangible or intangible, as in the case of research findings formalised in an internal memorandum, an article or a patent for example.

This paper is based on material drawn from various surveys carried out mainly in France between 1990 and 2013. In the first part, we examine the strategy underlying the diffusion of management by time and in particular project-based working, which is now firmly established in both industrial and academic research. In the second part, the research methodology is outlined. In parts three and four the results are analysed. The third part focuses on those concerning the diffusion of new management by time norms and their effects on the various forms of research (operations or projects) carried out in industrial and academic research and in collaborations between industry and academia. The fourth part examines those relating to the effects of this mode of management on research workers' temporalities. In the concluding part, we examine the contribution such an analysis makes to the evaluation of Triple Helix relations.

1 The diffusion of management by time applied to research activities as a basis for Triple Helix analysis.

1-1 From social times to management by time

Social times have always been an object of sociological research (Durkheim (1926) Gurvitch (1964) etc.). Durkheim noted that the multiplicity of social times and collective rhythms made any investigation of them a complex matter: "*a calendar expresses the rhythm of collective activities, while at the same time its function is to assure their regularity*". Merton and Sorokin (1937) declared "*that systems of time reckoning reflect the social activities of the group*". Increasing numbers of researchers in the social sciences have chosen to take the analysis of social times as a starting point for evaluating social change and comparing some of the dynamics within society (Adam 1990, Rubery J., Grimshaw D. 1994, Gershuny 2000, O'Reilly and al. 2000, Roe and al. 2009). Sociologists make a distinction between 'social times', which are objective times observed from outside the individual, and 'social temporalities', which are linked to individual subjectivity and lived experience (Mercure 1995, Dubar

2004). Economists, concerned as they were with calculation, have taken time as one of the possible ways of measuring work, while most sociologists of work have made it an essential part of their analyses (Neville 1972). For some years, the question of times has been addressed in organisational research, either as a necessary element of all research or as a specific area of enquiry (George and al. 2000, Ancona and al. 2001, Mitchell and James 2001, Roe and al. 2009). Thus researchers in management recognise that organisational processes and structures are constructed on the basis of the working day and week, cycles of individual and collective activity, deadlines and production times and the stresses they generate. Managers who until recently were concerned only to ensure that the working time devoted to a task was as short as possible in order to increase productivity are now concerned with the quality of the service or product provided and the actors' temporalities. This article focuses in particular on the way in which managers use time, i.e. on management by time.

1-2 Research times

Production time in manufacturing industry has been described as predictable, linear, routine and cumulative (Mercure 1995), which makes it easy to manage. The duration, aims, rhythms and evaluation of research, on the other hand, are subject to specific constraints that set it apart from other productive activities (Merton 1976). Its time horizons are long, its production processes are risky, unpredictable and, on the face of it, difficult to control, its results are uncertain and it has its own occupational structure that rests on specific norms and researcher autonomy (Barrier 2011). The management of research long posed problems for company management which, depending on the period, circumstances and individual cases, fluctuated between, on the one hand, allowing the research function to govern itself in order to give free rein to researchers' creativity and possibly benefit *a posteriori* from their discoveries and, on the other, making it dependent on other functions and the company's internal management hierarchy. Academic institutions, for their part, opted to leave '*the community of peers*' free to regulate the profession internally. Consequently, research was administered in different ways depending on its particular time horizons, the institutions supporting it and the various segments of activity linking it to the market and in which research staff operated (Salge 2012). Thus basic research planned as part of a programme to be implemented over the long term was managed within universities, while more applied research with precise objectives that could be implemented within a predefined, limited timeframe was the province of business and industry.

However, since the early 1990s, the position of research in wealth creation has changed. Economists now correlate a nation's competitiveness with its companies' ability to innovate as quickly as possible in markets; this ability, in turn, depends on the quality of the links they maintain with research systems (Dagusta and David, 1994, Gibbons and al. 1994, Etzkowitz and Leydesdorff, 1997, 2000). This general observation, which actually goes back a long way (Baumgartner, Jones, 1991), is the reason for both the increased competition between the various actors in research and their need to collaborate with each other.

Competition prompted these actors, on the one hand, to adopt a strategy of shortening production times and the time required to bring new goods (publications, patents, products, services etc.) to market with the aim of reducing costs and, on the other, to rationalise research processes and to intensify researchers' work rate.

The need to collaborate, to forge links between academic and industrial research and thereby facilitate cooperation encouraged the various actors in research to examine the ways in which this function was administered and the differences that existed between them.

1-3 The rise of management by time

It was against this background that those responsible for the governance of research, i.e. corporate management teams and university leaders, were driven to consider instituting a new mode of research management. Engineering activities in manufacturing industry had already been faced with the need to reduce the uncertainty and cost of large-scale works, particularly during the construction of new industrial sites or new production facilities. In response, companies introduced management by time by institutionalising a form of organisation known as project-based working. Drawing on these practices, managers planned to apply this management by time to research activities. Research has traditionally been organised around a division of labour based on operations. These 'research operations' are internal to research centres and managed by the centre's own management team; their objectives are defined in terms of research strands linked to the advance of a discipline or of an interdisciplinary field and are not time-limited. There is no precise division of tasks; rather it varies according to the way the permanent discussions held within the group develop. The quality and relevance of the work carried out are evaluated by each institution in accordance with its professional rules.

These operations are not the same thing as 'research projects', which are prepared in response to a specific commission, which may originate from within a company or university but may also come from outside. The client is usually also the project funder. He specifies the results he wishes to obtain in terms of innovations that have prospects in identified markets: this may be a publication for a particular academic journal, a patent that may pose a challenge to an existing one, a good in a market for particular products, a service etc. He organises the management of the project by appointing a project manager. In discussions with this project manager, he specifies the duration of the work, divides it into segments and plans their scheduling. He chooses the resources, particularly human resources, to be deployed in each of its stages from within the research centres and institutions involved in the project. The work group is overseen jointly by the client's management team and that of the project manager. The client evaluates the project at the end of each stage and then again when the project has been completed. In doing so, he compares what the project was expected to deliver and the promises made during the planning phase with what has been achieved and contrasts the notional timings calculated by management with the timings actually recorded. Thus the evaluation focuses more on the results of the procedure and its compliance with the project specification than on the advances made with the research.

1-4 The application of management by time

It is difficult to apply this form of management to research, whether in industry or academia, because of the activity's specific characteristics (unpredictability, uncertain production processes, difficulty in recording and measuring working times, etc.) Nevertheless, faced with increased competition, first companies and then the European authorities and the French government began to promote it and then introduced it as a management tool designed to make research systems more efficient (Theves and al. 2007).

Companies began to apply this mode of management to projects originating from other firms or institutions and then to internal projects, although different functions were mobilised for the different types of project. This strategy reinforced the grouping of certain competences into specific units and the outsourcing of certain tasks. This led to the creation of service units with particular technical or scientific capabilities; these units could be located inside or outside the company or operated jointly with another firm, a higher education establishment etc. (examples: technology platforms, spin-offs etc.). This new network configuration was, in part, the product of project-based working, in which each

stage has assigned to it a specific research activity, a specified result, a length of time and specific competences, but at the same time it reinforced management by time.

Research in France had always been funded by the state on a recurrent basis, while firms provided funding for specific programmes in a way that remained more or less covert. Since the end of the 1960s, the public authorities had allocated increasing amounts of contractual funding to research establishments, either directly or indirectly through their supervisory bodies. These contracts defined the research topics more or less precisely and ran for negotiated periods of time. The funds were paid into the research establishments' general budgets, the work was carried out by researchers without it being assigned to any specific team and at the end of the contract a report was submitted. In view of the priority now given to research and innovation and to cooperation between business and academia, the public authorities increased the number of calls for tenders open to both companies and academics or to joint bids. In order to be able to compare and choose among the various bids and to facilitate the submission of bids involving several institutions, they set out the objectives of the programmes they were proposing to fund and laid down a single management framework and strict rules. Thus the projects planned in response to European calls for tender, those issued by the French National Research Agency (ANR) and so on stuck to the research topics proposed, the organisation required, the results to be produced, the deadlines imposed, etc.; this mode of research management was designed to facilitate 1) cooperation between different actors following the same organisational principles, 2) competition between different research programmes, institutions and individuals and 3) a reduction in costs. As it had it in firms, this new management by time contributed to the establishment of innovative companies spun off from universities and the constitution of technology platforms or skill centres, whether inside or outside each institution.

The emergence of such policies raises several questions which our surveys attempt to answer:

- Has this management by time been appropriated by research establishments? How has it been appropriated? Has it been used in the same way by academic research institutes, research departments in industry and intermediate organisations? Has it helped to facilitate relations between them? Has it triggered a dynamic between them?
- It has placed new constraints on research workers and possibly created new advantages for them as well. How do their new temporalities interact with each other? Have they led to the emergence of new relations between them and given fresh impetus to their exchanges?

2 - Methodology. '316

In order to investigate the effects of the spread of project-based working on the temporalities of research organisations and those of research workers, we will draw on several case studies we have carried out over the last twenty years in research organisations, most of them located in industrial research departments, in academic research institutes and in intermediary organizations (Lanciano-Morandat, Nohara 2006) in France. A date can be put on all these surveys, that is to say each situation investigated reflects just one particular moment in time; only one firm was surveyed a second time, 15 years after the first survey (cf. Table 4 in the annex: The survey characteristics).

The units investigated are active in the fields of chemistry, biology and biotechnologies. This choice was determined by the characteristics of chemistry, which has always been located between science and industry and the new scientific and technical advances made in biology. In the course of these surveys, general data on the research units investigated were gathered: information on the evolution of research strategies and modes of organisation, interviews with the various protagonists (clients, project managers, researchers, engineers etc.) and so on. Furthermore, 25 research measures – operations and projects – were subjected to detailed analysis. Without being truly representative of the evolution of research in France, these studies do seem to reflect part of its history.

3 – Towards management by time

Project-based working involves comparing, at regular intervals, the notional time horizons for the research established *ex ante* by the client with the actual times taken recorded *a posteriori* and to use the results of the comparison as a management tool.

The main results of the surveys used in our analyses are summarised in Table 1 below:

Table 1: From management by research operations to management by research projects

- 1- The acronyms indicate 1) the sector to which the establishment investigated belongs (Chem, Pharma, Perfu, Biotech), 2) its status (C=company, U= university establishment, JU= joint unit (academic-industry), 3) the date of the surveys (990=90 ; 2000=200 etc.) and 4) the projects (number).
- 2- Collaborative projects between business and academia or research establishments engaging in such collaboration are printed in bold.

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|-----------------------|----------------------------|------------------------|-------------------------------|--------------------------|
| Management by time | Research operations | Adapted working | project-based and/or a | Research projects |
|-----------------------|----------------------------|------------------------|-------------------------------|--------------------------|

| | | | |
|------------------------------------|--|---|--|
| | CChem90 (1), CChem90 (2), UChe2), Cpharma201 (2), UChem13(1),(2),(3), UingR(11), Upharm12(1), UChem12 (1) | combined approach Cpharma201(1), (3)(4), CBiotech07, JUPharma08, CPerfu12, UingR(12), (21) Upharm12(2), Uchem12(2) | Cpharma200, CBiotech07 UingR3 |
| Client | Internal | External to the research institute for the university establishment (response to call for tenders), management decision for the company | Internal or external to the research institute |
| Objectives of the research measure | A scientific direction | Scientific result specified | Specification of results in terms of products (publications, patents, goods, services etc.) and prospects (scientific market, product market etc.) |
| Management | Head of establishment | Project manager – self-appointed in university establishment, appointed by management in the company | Project manager appointed by company management |
| Duration of measure | Variable with possibility of renewal from year to year | Duration limited ex ante with possibility of extension | Duration limited ex ante and of one or more years |
| Organisation | Ill-defined ex ante | Indicative definition of | Notional definition of |

| | | | |
|---------------------|---|--|---|
| of work over time | Indicative planning possible | various phases and research work, schedules | different phases and research work; institutionalisation of scheduling, deadlines and pace of work |
| Permanence of group | Permanent | Group established ex ante but subject to change | Group established ex ante |
| Supervision | Flexible and internal to the establishment and/or research team | Project manager's responsibility | Carried out by the project manager under the client's direction |
| Evaluation | 'Peer' evaluation based on the reputation of the research | Evaluation during the process and at the end of the project by superiors ('peers' and/or management) | Evaluation during the process and at the end of the project based on success of products in target market |

2-1 Operations-based management

The data used in our analysis were gathered over a long period between 1990 and 2013. They reveal a gradual shift from a mode of management with few time constraints to a constraining mode based on time accounting. Thus in the earlier surveys (1990 and 1998), which were conducted in a context in which competition was less intense and research was not credited with any significant economic effects, management in both industry and academia was based on research operations. During this period, two research units, one in industry and one in academia, used this mode of management, which none of the units studied has adopted since then. These two units cooperated, the first with academic research units, the second with units in industry. However, this did not change their ways of working. Their research operations were an integral part of the general problems addressed by each unit, although there was no precise objective or timetable. For the university research unit, the aim was to invest in a new multidisciplinary field, while for the industrial unit it was to produce specific scientific information on a range of products. The managements of both units hoped to obtain results

that could be used either immediately or at a later date once specific knowledge and competences had been accumulated. On the other hand, a research establishment in a Swiss university was still using this mode of management in 2013. Switzerland has decided to encourage scientists to quicken the pace of their academic work while at the same time maintaining a high level of originality and quality by funding them through the universities and a funding agency. However, in contrast to what happens in a number of countries, and particularly in France, this agency pays research unit directors on the basis of a statement on the scientific path they have chosen to explore and a programme of activities that is vague and changes over a period of several years. The research units and operations investigated in this establishment had no contact with industrial research and no strategy for establishing such contact.

In our view, this operations-based management does not constitute management by time, since it is not based on a systematic comparison of nominal times and actual times.

2-2 Project-based working

This mode of research management was observed in two industrial establishments and one university research institute in 2000, 2007 and 2011 respectively. The first had an innovation strategy that placed it as close as possible to patients' immediate needs; its new products were intended to be brought to market quickly after they had been designed. The company management decided several years before the survey to accelerate these research processes by shortening deadlines and monitoring application of this measure very strictly. The second was a start-up founded by researchers from university research establishments with a view to transformimng a discovery into an innovation that would be profitable in the market. The third, a university research institute, had the same objective as the second but was operating out of an engineering school. Their project was the company or the research institute, that is to say their procedures were the same and the programming planning of one was the business plan of the other. The time constraints were all the more pressing since the company's future and that of the research institute depended on them. In these two companies and in the research institute, there was total management by time.

2-3 Adapted project-based working

Many of the research establishments investigated could not, on the basis of the criteria used, be put into either the operations-based or project-based category. Rather they had adopted a form of project-based working adapted to the specific characteristics of their research. When the project managers

are academics, the research work is carried out in response to a call for tender that already partly determines the content of the work, the outputs, the duration and who plays the role of principal. The project manager is the researcher who has taken the initiative to respond, he sets out in his bid the scientific result he expects to present at the end of the project, selects the group of researchers who will carry out the work, negotiates with them the expected outcomes, the stages that will be required in order to bring the project to its conclusion, the time required for each stage and so on. However, this specification is only indicative. It can be challenged and updated at any time and is used as a path that indicates the route to be followed and the pace to be adopted. When the project managers are company employees, they are appointed by management, who also specify the project's objectives and its time constraints. In academic research, the researchers are involved in specifying the expected results and the division into segments of activity and the duration and pace of work are all negotiated. This is not the case in industrial research, where management and the project manager they appoint have complete control. While both types of projects are based on pre-specified results, it is not necessarily envisaged that the outputs will be exploited in a market. The division of the project into stages and its time constraints can be called into question at any time.

2-4 'Mixed' or 'hybrid' modes of management

Other research establishments combine operations-based management and an adapted form of project-based management. When the research to be carried out is internal to the establishment and it is not planned from the outset to be developed, it is managed as a series of research operations. When it involves collaboration between several research teams in industry and academia, the adapted form of project-based working is used. This mixed mode of management is almost always adopted in academic establishments, firstly in order that the director retains control of the centre's academic orientation and schedule and, secondly, in order to enable its researchers to develop their creativity. This type of management is also being adopted increasingly in industry, since it enables firms to use one of two types of management depending on the type of workers deployed. Operations-based management is used in order to maintain cores of scientific specialists in certain areas (skill centres, technology platforms etc.), to give them a certain freedom of action and to make use of their advances subsequently. An adapted form of project-based working is used in order to facilitate coordination between units and institutions, and in particular with the world of engineers. In hybrid organisations, such as the research institute we investigated that is operated jointly by the CNRS and a large

pharmaceutical company, this mixed mode of management enables each team, whether industrial or academic, to have its own scientific orientation and facilitates the joint administration of shared projects.

The surveys show that this management by time, in particular project-based working, has been appropriated by French research establishments, whether in industry or academia. Nevertheless, the use of a model designed for engineering has been adapted and combined with operations-based management in order not to curb researchers' autonomy and creativity.

It would seem that the specification of results and the recording of hours worked have changed scientific activity, with the work completed in each phase of a project being systematically monitored. These changes have worked to the advantage of all the institutions, to the extent that they have led to the development of a continuum of similar practices. Management by time has enabled academic research establishments to fix their own schedules and targets for publications or patent applications, while it has enabled research establishments in industry quickly to start making a contribution to their companies' innovation projects when necessary. As the changes in the management of their research show, their common learning processes and their virtually identical ways of working seem to help them expand their collaboration with each other. Nevertheless, their research activities continue to be subject to different modes of regulation, with the professional model retaining its importance in academia and the hierarchical system being firmly established in industry.

4-The constraints and advantages of this new mode of management for workers' temporalities

The introduction of management by time has not produced the same constraints and advantages for all research workers. Rather they are different for each of them depending on the stage of their working life, training or type of activity and their status and occupational category. The constraints are linked primarily to the pre-specification of results, their work schedules, the planning and then monitoring of their working hours and the phases when the process is accelerated, with each of these times having a different effect on work rates, management supervision, length of employment etc. The main advantage is the reduction of the profession's permanent uncertainties, but becoming accustomed to short deadlines and enforced work rates can also enable research workers to become more competitive individually in their various markets (publications, products etc.) and thus put themselves in a better position when it comes to seeking new jobs, promotion etc.

4-1 The constraints and advantages (*italic*) by stage of the working life

There is no clear division in researchers' working lives (Naville 1972) between the period of training and that in which professional activity is recognised (Lanciano-Morandat, Nohara 2013). However, the work is organised differently depending on the way in which the research in question is managed. During their initial training, research students have a supervisor who suggests a particular academic pathway to them, specifies the results in order to limit the PhD to the standard three years and controls the research agenda. They enjoy little of the freedom of a researcher, although they worry about the uncertainties that hang over their work: the fear '*of not having any results*'. Within this frustrating framework they gradually learn their trade. On the other hand, when they get involved in the adapted form of project-based working, they have to immerse themselves in agreed topics, the group organisation and a programme of work that may take place outside of the close relationship they have established with their supervisors. They are often divided between the schedules and work rates imposed by their supervisors and those laid down by their project managers. If they have the self-confidence to complete their PhDs in good conditions, without any serious fears, they do not become familiar with the uncertainties of the research profession.

Table 2: The constraints and advantages (italic) of this mode of management for workers by stage of the working life

| | Research operation | Adapted project-based working | Research project |
|--------------------------|---|--|--|
| Training | Time constraints for thesis +uncertainties about results; stress of the uncertain <i>Initiation into the freedom of the researcher</i> | Programming of work and pre- specification of results. Time and scheduling constraints. <i>Initiation into the time constraints of industrial research; reduction of uncertainties about the results.</i> | - |
| Professional activity | Few time constraints, research freedom limited to the group. <i>Researcher autonomy vs. judgements of 'peers' or</i> | Programming of work and pre- specifying of results as constraint. Constraints arising out of deadlines and schedules <i>Learning to meet deadlines</i> | Programming of work and pre- specification of results. Strong time |

| | | | |
|--|--------------------|---|--|
| | <i>supervisors</i> | <i>enables researchers to work more quickly and hence be more competitive in markets.</i> | constraints. <i>Speed with which results are produced</i> |
|--|--------------------|---|--|

When the research is managed on an operations basis, professional researchers are subject to few time constraints. They are able to plan or negotiate their own research themes and the scheduling of their work. Their involvement in a project, on the other hand, is discussed and negotiated in advance in order that agreement can be reached on the research theme, and consideration is then given to the hoped-for results, deadlines, etc. The fixing in advance of the various phases of the project and their duration and the systematic monitoring thereof are regarded by some of the researchers we interviewed as the Taylorisation of research that could lead to a decline in researchers' creativity. On the other hand, adapted project-based working is also seen as enabling them to operate more quickly in a competitive environment, which is advantageous to their careers.

4-2 The constraints and advantages (*italic by status*)

This categorisation compares, firstly, employees with contract workers regardless of the length of their contracts and, secondly, workers engaged in academic research with those employed in industrial research.

In the first comparison between employees and contract workers, two differentiating factors emerge, namely job and age: the employees are senior workers with a stable job, while the contract workers are juniors who are still regarded as trainees and spend only a limited amount of time in the research establishment. For employees, the introduction of management by time generally gives rise to additional constraints on their freedom to choose their own research themes and agenda; conversely, their new professional practices enhance their ability to integrate into globalised scientific networks. Contract workers are answerable to the establishment management when the research they are working on is managed on an operations basis; they feel they are precarious workers in a stable organisation that they hope to join. When they are employed on a project, they are under the supervision of the project manager and the main 'producers' of the research. In other words, they are the ones who carry out the protocols, do the experiments, bring out the results and so on. Employees, for their part, devote themselves to constructing research themes, compiling agendas and making use of the results. They endure a number of time pressures in terms of deadlines, work intensity etc., but

at the same time they feel they are laying the foundations for their future careers by accustoming themselves to the routines and quicker pace of industrial research and learning more generally about the world of production.

When the temporalities of research workers in industry and those in academia are compared, two fundamental differences emerge: fixed work schedules and importance of the functional hierarchy for the former, their non-existence and the obscure nature of authority for the latter. Thus employees in industry have working hours defined by law (the 35-hour week) and company agreements; these hours are imposed on them, whether they be researchers or manual workers, and thus beyond a certain time research establishments and workshops close. In academic research, establishments' opening hours are long and can be extended, enabling researchers to manage their daily, weekly and monthly working times themselves. In the same way, researchers in industry have an identified supervisor, they have a place in an institutionalised organisational chart and a relatively stable hierarchical pyramid; academic researchers, on the other hand, operate in a world in which occupational classifications are certainly significant but never wholly explicit.

Traditionally, researchers in industry have had an obligation to carry out certain research and keep a record of their work, while academic researchers are merely encouraged to do so. Consequently, the changeover from operations-based management to project-based working has been more of a shock for academic researchers, since they have had to adapt and accommodate themselves to programmed research, meet its deadlines and accept management supervision. Researchers in industry have daily working hours that enable them to let go and make a clear separation between their working day and their lives outside work. Academic researchers, on the other hand, extend their working time in order to achieve the objective laid down for the project, making the constraints self-imposed as it were. These tendencies are even more pronounced among contractual workers; whether in industry or academia, their supervisors impose constraining temporal norms on them. However, we noted that they tend to intensify them still further in the hope of either obtaining a permanent position or improving their position in external labour markets.

Table 3: The constraints and advantages (*italic*) of this mode of management for workers by status

| | Research operations | Adapted project-based working | Project-based working |
|---|---|--|--|
| Academic researcher in permanent employment | <p>Incentive to become involved in the establishment's academic management.</p> <p>No time constraints.</p> <p><i>Researcher autonomy vs. 'peer' assessment.</i></p> | <p>Obligated to adapt, after negotiations, to the objectives and deadlines agreed by the client and the project manager;</p> <p>increase in daily and monthly working times</p> <p><i>Reduction in uncertainties; stress caused by lack of results; able to publish more quickly; accelerated career.</i></p> | <p>Obligation to produce the pre-specified results and meet the deadlines for each phase of the project decided by the client and the project manager.</p> <p><i>Participation in a group that can compete in the markets; accelerated career.</i></p> |
| Industrial researcher in permanent employment | <p>Obligation on researchers to stick to themes selected by management.</p> <p>Constraining work schedules.</p> <p><i>Relative autonomy for researchers in the face of management decisions and judgements.</i></p> | <p>Obligation to adhere to the objectives and deadlines decided by client and project manager.</p> <p>Constraints in terms of deadlines and work schedules.</p> <p><i>Creation of a parallel hierarchy; improvement of cooperation with academic researchers and with other departments in the company; possibility of increased mobility; accelerated career.</i></p> | |

| | | | |
|--------------------------------------|--|--|---|
| Contract worker in academic research | Obligated to comply with management directives. Constraining work schedules. <i>Learning the trade and becoming accustomed to its uncertainties</i> <i>Openness to the academic labour market</i> | Obligated to comply with directives issued by immediate supervisor on the project. Constraints in terms of deadlines. <i>Getting used to time constraints; reduction in uncertainties about results.</i> <i>Openness to labour markets.</i> | Obligated to comply with directives issued by immediate supervisor on the project. Constraints in terms of |
| Contract researcher in industry | Obligated to comply with management directives. Constraining work schedules <i>Initiation into the temporalities of industrial research and its temporal and management constraints.</i> <i>Opportunity to enter the labour market for industrial research.</i> | Obligated to comply with directives issued by immediate supervisor on the project. Constraints in terms of deadlines. <i>Initiation into research and management by time.</i> <i>Opportunity to enter the academic labour market.</i> | deadlines and work schedules. <i>Possibility of renewing contract.</i> <i>Initiation into the contract research profession.</i> |

4-3 The constraints and advantages (*italic*) by occupational category

The change in management practices impact particularly on four occupational categories: the newly created project manager category, post-docs, engineers and technicians and employees in start-ups or service companies.

In the traditional organisational structure, each establishment has a director and possibly a number of team leaders who supervise and coordinate the various research operations. As far as research workers are concerned, project managers are superimposed on the functional hierarchy. Thus in

establishments that have adopted a mixed mode of management, the team leaders manage the scientific routines, the long discovery times and the creation of new knowledge and expertise, while the project managers work at a far quicker pace, focusing on innovative dynamics, accelerating the research processes etc. Positioned midway between client and research group, project managers act as timekeepers. As such, they are forced to abandon their own temporalities as researchers and adopt those of management. The transition between the long time horizons of research and the haste required in project management gives rise to so-called 'managerial' stress (Chateauraynaud 2012); this is different from the stress experienced by researchers, which is related to the quality of their work, while project managers are more concerned to ensure that the results match expectations. Nevertheless, taking on the burdensome role of project manager is a career accelerator for all researchers.

Post-docs constitute a category that until 10 or so years ago was little represented in France. Its growth is linked in part to the introduction of project-based working in research; these impermanent forms of research organisation require flexible human resources with a high level of scientific expertise. PhD students are allocated to work on projects but are not the mainstays: they have to produce an original piece of work over the three-year period and are often supervised by a researcher other than the project manager. Post-docs, on the other hand, are young researchers who already have validated experience of research, can be hired in France on renewable 18-month contracts, are put under the authority of the funding body and, since they are looking for a permanent position, are a particularly malleable source of labour for project managers. They are therefore versatile and can help to define the research questions, draw up research agendas and exploit the results as well as producing the results themselves. They are mobile throughout the process and can be employed as 'spearheads' and subsequently as 'stopgaps'.

Engineers and technicians tend to be fewer in number in French research establishments. They take part in one operation or another as instructed by management for a predetermined period of time as the investigations advance. Regardless of the establishment in which they are employed, their working hours are determined and restricted by the established legal standards. They can be seconded to certain projects and will have to tolerate the subsequent upheavals. Usually, however, when a project is being set up, they are grouped together in a unit that comprises all the necessary technical competences. These units make it possible to protect the productive dynamics and specific

temporalities of engineers and technicians while at the same time keeping them in the background. Thus these workers have to respond within a certain time to the project manager's demands as they would have to if they were employed by an external service company.

Employees in start-ups and service companies work exclusively on projects, are subject to the most intense time constraints and benefit little from them professionally, even though higher salaries may possible compensate them to some extent for these drawbacks.

Table 3: The constraints and advantages (*italic*) of this mode of management by occupational category

| | Research operation | Adapted project-based working | Project-based working |
|------------------|--|--|--|
| Project managers | - | Managerial stress <i>Progression up the functional hierarchy</i> | Managerial stress <i>Progression up the functional hierarchy</i> |
| Researchers | Freedom to choose research themes. Working hours constraints for researchers in industry. | Incentives to follow project manager's directives on research orientation and deadlines. <i>Reduction of uncertainties;</i> <i>Ability to produce more quickly and hence to acquire greater visibility in markets.</i> | - |
| Post-docs | Subordinated to the establishment's management. Constraints imposed by deadlines. Limited duration of employment contract. <i>Initiation into the research profession, its autonomy and its</i> | Strong managerial and temporal constraints. Total dependency on the progress of the process (stopgap). <i>Possibility of renewing contract.</i> <i>Initiation into the contract research profession</i> | Obligated to obey instructions given by immediate superior on the project regarding work to be carried out. Constraints in terms of deadlines and work schedules. <i>Possibility of renewing contract.</i> |

| | | | |
|---------------------------|--|--|---|
| | <p><i>uncertainties.</i></p> <p><i>Possibility of entry into academic labour market.</i></p> | | <p><i>Initiation into the contract research profession.</i></p> |
| PhD students | <p>Under the authority of PhD supervisor</p> <p>Constraints in terms of schedule.</p> <p><i>Initiation into the profession of researcher and its uncertainties.</i></p> <p><i>Integration into the research establishment.</i></p> | <p>Under the authority of PhD supervisor and funder.</p> <p>Constraints in terms of research results and deadlines.</p> <p><i>Adjustment to time constraints in industrial research; reduction of uncertainties with respect to results.</i></p> | - |
| Engineers and technicians | <p>Subordination to establishment management.</p> <p>Constraints in terms of work schedules.</p> <p><i>Stability of employment for engineers and technicians. Involvement in work group</i></p> | <p>Subject to the time constraints of the technical skills centre management.</p> <p>Excluded from the research group.</p> <p>Must respond immediately to project manager's demands.</p> <p><i>Fixed working hours; regular work rate.</i></p> | - |
| Service company employees | | | <p>Subject to the client's time constraints.</p> <p>Immediate response to project manager's demands.</p> <p><i>High salaries.</i></p> |

Management by time, a tool used in both industrial and academic research, changes the temporalities of research workers in particular, causing them to converge to some extent. The relative standardisation of time practices would appear to be increasing their opportunities for cooperation. They are all aware of the increase in work rates that impact on their availability and hence on their creativity, which certainly gives rise to tensions with project management. They are also aware that this quickening of the pace of work goes hand in hand with an increase in competition that may have positive or negative consequences for them. In their view, the management hierarchy, which is constantly evolving, will no longer be based on status or occupational category as it has been since time immemorial but linked rather to each researcher's constantly questioned productivity. Eventually, this will work to the advantage of junior contract researchers and project managers, but only for a limited time, which is a new phenomenon in France and one that is certainly of concern to all these workers.

Conclusion :

All organisations carrying out research, whether in industry or academia, have to put in place arrangements that both encourage cooperation and stimulate competition between individuals. No institution can truly control such an ambiguous system, in which one of the constituent principles may at any moment gain the upper hand over the other, which would ruin the output of the organisation as a whole. If a team were to assimilate these constraints perfectly, it would become virtually autonomous, the base for a separate management structure and would be impervious to any outside influence other than shocks intended to destroy it. These issues were for a long time circumvented only by defining research as an occupational system through which its various members could be controlled. This was a temporary solution that could be adopted only at a time when the research community was small, unified by shared occupational and employment statuses and still dependent on university networks and their funders.

For some years now, the French government, aware of the role research as a whole plays in wealth creation at national and global level, has been encouraging managers to adopt a common management by time system. The aim of this strategy is to improve the monitoring and hasten the pace of academic/scientific work and enhance research teams' capacities for collaboration. Even though tensions have existed in certain cases, the process of harmonisation has begun and research workers have seen their work temporalities disrupted. However, this initial consequence tells us little

about the advantages of this mode of research management over the long term. After all, the decision not to tackle or cooperate on anything other than topics presenting little risk and to monitor only the procedures of research work rather than its quality could give rise to a research system that was homogeneous but uninventive and ultimately non-innovative. Thus research management is by no means immune to the possibility of innovation.

This article has focused on the analysis of time by tracking the effects of a new policy of management by time on research work, whether in industry or academia, and by making systematic links with individual temporalities. This approach constitutes an attempt to open up the Triple Helix to both organisational studies and microsociology. It enables us to track as closely as possible the dynamics that are emerging between the academic world and the world of business and to assess the consequences of a management tool for interactions between the two spheres.

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Annexe: The surveys carried out

| Date of investigations | Type of company or academic institution | Type of research unit or project | Acronym |
|--------------------------------------|--|---|---|
| 1990 Action 1 Action 2 | French chemical company, part of a multinational oil company | Fine chemicals research centre including 'pilots' and adjacent to production units. Collaboration with academia up to and including bringing a product to market. Internal to the company's research department | CChem90 CChem90(1) CChem90(2) |
| 1998 Action 1 Action 2 | Lyon University | Joint stereochemistry research unit Collaboration with industry Internal project | UChem98 UChem98(1) UChem98(2) |
| 2000 | French site of a German pharmaceutical multinational | Pharmaceutical research unit located in Lyon | CPharma200 |

| | | | |
|-----------------|--|--|---------------|
| 2000.....2012 | French pharmaceutical multinational | Research centre | CPharma201 |
| Action 1 | | Collaboration with academia up to and including bringing a product to market | CPharma201(1) |
| Action 2 | | Collaboration with academia | CPharma201(2) |
| Action 3 | | Internal to the company's research department | CPharma201(3) |
| Action 4 (2012) | | Internal to the company's research department | CPharma201(4) |
| 2007 | Biotech start-up in the Paris region | Research department The company as a project | CBiotech07 |
| 2008 | Joint CNRS-Industry pharmaceutical research unit | The unit as a project | JUPharma08 |
| 2011-2012 | Engineering school | Organic chemistry research laboratory (1) | UEngR11 |
| Action 1 | | Internal project | UEngR11 (1) |
| Action 2 | | Project leading to a start-up | UEngR11 (11) |
| | | Physical chemistry research laboratory (2) | UEngR11 (12) |
| Action 1 | | ANR project internal to the laboratory | UEngR11 (2) |
| | | Colloids and Divided Material Laboratory (3) | UEngR11 (21) |
| Action 1 | | The laboratory as project | UEngR11 (3) |
| 2012 | Perfume and cosmetics company | Research laboratory Internal project | CPerfu12 |
| 2012 | Doctoral school based in a unit in an engineering school | Chemistry of condensed matter laboratory | UChem12 |

| | | | |
|-----------|---|--|------------|
| Action 1 | | Internal project | UChem12(1) |
| Action 2 | | Collaboration with industry | UChem12(2) |
| Action 3 | | Collaboration with other academics and several companies | UChem12(3) |
| 2012 | Doctoral school in a university in the Paris region | Chemical and pharmaceutical research centres (3) | UPhar |
| Action 1 | | Internal project | Uphar(1) |
| Action 2 | | Collaboration with industry up to and including bringing a product to market | Uphar(2) |
| 2012-2013 | Swiss university | Chemistry and biochemistry laboratories | UChem13 |
| Action 1 | | Internal project | UChem13(1) |
| Action 2 | | Internal project | UChem13(2) |
| Action 3 | | Collaboration between academics | UChem13(3) |