The "Discipline" of Post-academic Science

Reconstructing the Paradigmatic Foundations of a Virtual Research Institute

Hellström, Tomas; Wenneberg, Søren Barlebo

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Authors:

Tomas Hellstrom
Søren Barlebo Wenneberg

Affiliations:
Department of Management, Politics and Philosophy
Copenhagen Business School
Blaagaardsgade 23 B
DK-2200 Copenhagen
Denmark

Email: the.lpf@cbs.dk
Tel: +45 38 15 38 31
Fax: +45 38 15 36 35

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Abstract

This paper asks whether post-academic science, alternatively referred to as Mode 2 or Triple Helix, can be given disciplinary foundations in spite of its often-displayed organizational diversity, relevance orientation and transdisciplinarity. It answers the question in the affirmative, after having first reviewed and criticized a number of traditional concepts of disciplinarity and disciplinary emergence, established a new basis for conducting a paradigm analysis of fragmented, soft and user oriented fields of inquiry, and finally reviewed a case institute where this type of research has been sustained for over 10 years in a virtual setting (geographically distributed without a 'home base'). The argument of the paper is that the concept of post-academic disciplinarity may be reconstructed as the guiding principles of hybrid research collective's historical and institutional context, where a 'hard core' of reflexive communicative inclusiveness pertains vis-à-vis certain issues, instrumentalities and practitioner constellations.

Keywords: Post-academic science, research institute, disciplinarity, virtual

Introduction

The received notion of 'discipline' is often understood to refer to an area of instruction or expertise. In this sense the concept has been said to pertain to the 'disciplining' of students by the profession of academic instruction (Guntau and Laitko, 1991), to be a 'unified', 'autonomous' corpus of knowledge (Silliman, 1974), and to be a place of social association where academics shape a homogenous professional identity (Geiger, 1986). The concept of post-academic science (Ziman, 1994; 2000) or Mode 2 (Gibbons, et al., 1994) as it has been popularly referred to, challenges these notions with implications pertaining to a broadening of the legitimate sphere of academic involvement in terms of 'relevance driven' forms of knowledge production, as well as an insight that even the most 'basic' of research problems are essentially transdisciplinary and socially boundary spanning. By extension, the old 'carving of nature at the joints' is increasingly seen as a limited vision for guiding research organizations even towards more traditional goals of knowledge creation. Yet instead of losing itself in reactive instrumentality, research under the post-academic heading seems to develop a responsiveness to social and existential dimensions of human life, and to display an increasingly collectivised inclusiveness of a variety of perspectives and disciplinary outlooks (Hellstrom and Jacob, 2000; Ziman, 2000). While 'disciplinarity', just like its uncomfortable bedfellow 'paradigm', in a traditional sense can be said to find its foremost expression in guiding researchers towards certain problems, post-academic science usually elaborates its problems in an extended context of relevance, sometimes referred to as 'context of application' (Ziman, 2000; Gibbons, et al., 1994) and sometimes to 'extended peer community' (Funtowicz and Ravetz, 1993). It thus carries within it almost the negation of disciplinarity as we are commonly used to

define the term (e.g. a 'hard-core' of interrelated common concepts and questions that guide problem choice together with a corresponding social organization).

Yet, while academia often welcomes interdisciplinarity on a rhetorical level, the actual trend, at least in many of the 'harder' sciences, is in the opposite direction with increasing specialization, diversification and fragmentation (Fuller, 1993). This trend risks creating a rift between basic, yet very fragmented specializations and more pluralistic, transdisciplinary contexts of knowledge creation: a development which in the end may hamper a meaningful and creative policy driven advancement of academe towards a more democratised state (Fuller, 1997). The apparent lack of a post-academic discipline amenable to traditional academic meta-standards seems to be a source of worry among proponents of traditional forms of research (Evans, 1999). Commentators on so-called Mode 2 knowledge production have for example focused on the problem that it does not seem to recognize enough the need for a formalized and internally received justification phase in academic knowledge creation (Weingart, 1997). Here the conception is that justification of knowledge is connected to disciplinary institutions such as departments and journals, and that it is only through these institutions that the knowledge is truly validated.

The problem with this critique is that it is based on a naïve "truth as correspondence with nature" understanding of the product of academically produced knowledge, and further on an idealistic conception of the political economy of science. This correspondence and presentationist understanding is problematic from a socialized perspective because as it presupposes a conception of nature prior to and disconnected from the knowledge that is to be tested about it, e.g. it takes for granted that knowledge is tested through replication – while it is not (Collins, 1985). The understanding of the political economy of science is naïve because it assumes that it

progresses without any concern for the cost incurred, or that knowledge growth displays an 'increasing returns' logic in the social structure of academe (Fuller, 2002).

Acknowledging these reflexive imperatives, we are able to observe that the more research that is actually conducted in post-academic settings the more apparent it becomes that there is a 'discipline' to post-academic science, however not in the way we are used to the term. This paper is about reconstructing the notion of academic discipline within the framework of post-academic science, and to do this through a paradigm analysis of one of its typical organizational forms, an application oriented, virtual research institute oriented towards management and policy stakeholders. The paper will proceed by reviewing a number of conceptions of discipline found in the academic literature, and taking these often conflicting notions as points of departure elaborate a starting point for analysing the paradigmatic foundations for post-academic discipline. This emerging framework will then be used to break down a number of research projects found in a virtual academic institute, in order to empirically illustrate the extensionality of post-academic research discipline. Building on this example we will finally propose an outline of a framework, or a skeleton key, to understanding the emerging disciplinarity or 'discipline' of these types of academic collectives.

The concept of 'discipline' in a time of disciplinary transgression

The traditional concept of scientific (or broadly speaking academic) disciplines assumes a form of historical development based in the 'free' search for knowledge, where academic actors have self-organized, as if guided by and invisible hand, to join together specific strands of inquiry (e.g. Bush, 1945; Polanyi, 1962). This view of discipline formation suggests a 'servants of nature' view of the academic, where the

discipline is just as much a reflection of natural phenomena as is the rainbow. The socio-cultural corollary to this 'science as nature' view is of course the Mertonian norms of science (Merton, 1973), where the academic machinery is oiled by academics natural propensity to subscribe to communism (sharing of knowledge), universalism (applying impersonal criteria), disinterestedness (ideological and economic detachment) and organized scepticism (mutual and grounded criticism). As we go on to refer to the distinction between traditional and relevance driven forms of research we need to recognize that many of the concepts co-opted by the proponents of academic restructuring clearly deals with types of socio-cognitive action pertinent to both traditional as well 'relevance driven' academic activity. Some of these concepts are: 1) Strategic thinking: Strategy is a concept applicable to national science policy, the funding trajectories of research councils and to university managers at all levels. On the other hand individual researchers strategize in thinking about the future of their research, with regard to their common and aggregate interests, their collaboration patterns, and their competition patterns. 2) Innovations: New ideas and technologies affect the evolution of science through new organisational set-ups, new instrumentation, and new forms of socialisation vis-à-vis emerging communities of relevance. These aspects of innovation are just as 'disciplinary' as they are external to traditional scientific discipline. 3) Changes in the formal (e.g. the patent laws) and the informal institutions (e.g. culture) affect the internal as well as the external conditions for science, and has always done so.

Just as proponents of Mode 2 tend to emphasize the external context of science and disregard the sociality of its internal world, the traditional understanding of disciplinary science (autonomous, self-guided, self-organized, etc.) tends to relocate science to another reality altogether: to an unearthly and spiritual sphere.

Several of the classic concepts in the sociology of science point in this direction: Mannheim's (1976) 'free-floating intelligentia', Merton's (1970) puritanism in science, Polanyi's (1962) 'republic of science'. They are all the result of philosophical abstractions and idealisations or what Popper calls 'third world concepts' (Popper, 1983). While in these conceptions scientific thinking happens in a world consisting of logical propositions and objective empirical facts, a 'discipline' in the traditional sense represents a further abstraction, namely a reconstruction of the historical and situated development of such pure cognition.

Disillusionment with the prospects for 'free science' and the viability of the 'linear model of innovation' contained therein has led many to formulate alternatives to traditional assumptions about the logic of disciplines and discipline formation. John Ziman (1994) has suggested that under the new conditions of rapid innovation and increasing economic pressure on academe "…science inevitably becomes the subject of 'policy' debate, as scientists can no longer pull the strings behind the scenes and are forced to contend openly with rival interest groups in the public-expenditure arena (Ziman, 1994, p. 94). In Ziman's view, disciplinary impetus and invisible hands are increasingly subject to customer-contractor relations and social needs oriented governance: what he refers to as a state of 'post-academic science' (Ziman, 1996). One of the most clearly formulated implications of this new state is the OECD policy brief for techno-scientific progress that research must cross disciplinary, institutional and national borders (OECD, 1999).

Yet, many researchers involved in both basic and applied research still hold to the Mertonian norms of science as a useful ideal (Ernø-Kjølhede, 2001), not least because some form of social organization of science *qua* disciplinary seems to be a functional mode of academic governance (Hellström, 2002). One way of beginning to

loosen up the Mertonian norms with respect to disciplines is to acknowledge Bruno Latour's distinction between the concept of science and the practice of research, where "science is certainty; research is uncertainty. Science is supposed to be cold, straight and detached; research is warm, involving and risky." (Latour, 1998, p. 208). This distinction retains the Mertonian norms as a potential regulative system, while accepting that science as practice is an action oriented, contextualized human activity which may reconstruct its 'own' inter-organizationally derived norms in interaction with a diversity of actors (Etzkowitz, 1998).

Ernø-Kjølhede et al. (2001) has explored the distinction between science as a socially and epistemically regulative totality, and the organizationally embedded, relevance driven science. Against the image of traditional disciplinary development of research where the academic is 'self-organized and self dominated', they put the context dependence of norms, the continuous balancing of individual, societal and organizational objectives, and the dual governance of practitioners and peers over the formation of academic discourse. By accepting that no researcher is wholly 'disciplinary' or wholly 'relevance driven' it is possible to formulate more realistic and dynamic concepts of academic discipline for new hybrid forms of knowledge production.

Chubin et al. (1986) explicitly recognize the distinction between 'science' and 'research' from a social organization perspective, and point out that what we have traditionally taken to be scientific disciplines are now mostly relevant with regard to domains of teaching rather than to research. Research is in turn carried out mainly in smaller groups or 'intellectual units' in between those disciplines where teaching takes place (Chubin, et al. 1986). Intermediary to the 'intellectual units' and the broader, abstract disciplines, we find 'scientific or intellectual fields', which represent

larger social units of knowledge production and communication. According to Whitley (2000), it is in these broader units that academics develop distinct competencies and research skills, and these fields "structure the framework in which day-to-day decisions, actions and interpretations are carried out by groups of scientists" (Whitley, 2000, p. 8-9). This conception suggests a disciplinary corollary to Latour's distinction between science and research, and that when we talk about disciplines as a revealed form of academic activity it is Chubin's intellectual units and Whitley's broader intellectual fields that we a may legitimately speak of.

The disciplinary content then becomes that which individuals and groups bring to the field of academic action; their specific competencies or specialities. John Law, in a study of X-Ray Protein Crystallography (1973) has suggested that academics tend to develop specialities in either of three areas: (1) technique, methods and instrumentation, (2) theory development, and (3) subject matter knowledge. Instead of forming a homogenous set of these three specialities intermeshed under a 'general disciplinary competence', academics can modularise themselves into one of these areas. Such 'modularization' of disciplinary competence makes team formation more fluid and the single researcher more able to contribute in a variety of contexts.

These characteristics may also be derived from Becher's (1989) typology of disciplines, where hard and pure disciplines, which are inward looking, academically cohesive, and concerned with the discovery of universals, are contrasted with soft and applied disciplines which are concerned with particulars, have a familiar everyday language of discourse, and a pluralistic approach to quality and disputes. A somewhat more sophisticated way of formulating the formative dimensions of disciplines along these contextual lines is found in Whitley (2000), who describe disciplines as being located along two intersecting axes of task uncertainty (high and low) and mutual

dependence (high and low). Task uncertainty refers to the possible range of interpretation a discipline can legitimately display for a given problem, and in extension the degree of certainty with which a problem is defined as such in the first place. Similarly, mutual dependence refer to the organizational aspects of a research collective; whether a researcher can conduct his/her research relatively autonomous from colleagues, or whether he/she must operate with the physical backing of an organization of some kind. Whitley suggests that high mutual dependence and low task uncertainty is found in the 'mature' natural sciences like physics and chemistry, while low mutual dependence and high task uncertainty is more indicative of, for instance, business administration and other 'hybrid research collectives' (Whitley, 2000). It is clear that that a working concept of disciplinarity, in order to be useful for post-academic science such as it has been described above, must involve formative social and epistemic processes that has traditionally been separated by strict community boundaries, and even sometimes been considered contradictory. Next we will consider a number of ways by which to describe and analyse a research collective of the multidisciplinary, hybrid type described above through categories that allow these apparent contradictions to be resolved. To this end a framework for 'paradigm analysis' will be presented and then employed to outline and analyse the profile of a typical post-academic research organization.

Reconstructing discipline through paradigm analysis

The most common conception of scientific paradigms comes from Thomas Kuhn's *The Structure of Scientific Revolutions* (1962/1969). Without going too deeply into his specific arguments, one may still note that Kuhn's concept offers little help in unfolding the disciplinary conditions of fragmented post-academic science. In a broad

sense, the Kuhnian paradigm refers to a 'disciplinary matrix' of beliefs, values and techniques shared by a research collective, to which its members often unreflexively subscribe. In the more narrow sense a paradigm is an 'exemplar', or an influential presentation of a scientific theory. One may reflect that Kuhn's paradigm concept is either too unspecific to function as an analytical tool in its own right, or so specific and discriminatory that it leaves nothing to analyse in the first place (Shapere, 1964). One may also reflect that when seen as a concrete regulative for choices made in science, the Kuhnian paradigm concept paints a picture of academic work more in line with Latour's (1998) ideal 'Science' than with active and socialized 'research', in the sense that an 'abstract' system is allowed to determine a 'material' one.

Still, the Kuhnian paradigm concept gives us some indication of where to look when attempting to describe academic fields. In the *Postscript* to 'Structure', Kuhn suggests that historical-sociological analysis can reveal how exemplars and disciplinary matrices are constructed. He consequently suggests that social researchers should study, for instance, conference attendance, journal reading patterns, articles published and cited, and on the basis of this data identify 'communities of practitioners' (Kuhn, 1969). The researcher should then study the behaviour of these communities to see what commitments they share. Larry Laudan (1977) criticized Kuhn along the same lines as Shapere (1964) and others, and considered the paradigm concept difficult to use to make sense of the historical record of scientific change. He instead advocated a view of paradigms as being made up of essentially three different levels of commitment (Laudan, 1984): (1) to a particular ontology (significant components of the world represented as theoretical entities), (2) to a theoretical framework (the assumptions about how things are to be explained in a specific field), and (3) a set of methodological commitments (ways of collecting

data). He suggested that while any paradigm carries within it all three types of commitment, they in turn exhibit a relative autonomy vis-à-vis each other. If a research tradition makes substantial changes in its ontological components (say it adds theoretical entities), method can lag for a while, however eventually method and theory have to follow a changing ontology.

Differentiating of the paradigm concept in this way by removing its 'monolithic' assumptions, helps in the analysis of more complex academic traditions, e.g where ontologies, theoretical developments and changes in methodology corresponds differentially to various interests which are themselves changing over time. Törnebohm, went a step further in the direction of differentiating the paradigm concept and making it amenable to empirical analysis (e.g. Törnebohm, 1983; 1985). Extending Kuhn's original concept in a number of studies, he suggests four broad paradigm components:

(1) *Interests*: What the researcher wants to do.

(2) *Competencies*: What he/she can do.

(3) *Worldview*: The general assumptions about reality that the researcher makes.

(4) *Scientific outlook*: Assumptions about the academic field, what it should be involved in, its relation to other fields, its strategies, and the complex of tasks that the researcher may engage in. This broad category also includes two sub-components: (4.1) a *methodological commitment* (how the researcher should apply data collecting and transforming technologies general sense), and (4.2) a *research ideal* (more or less explicit desiderata for how the researcher wants the field to develop. In this view, an academic tradition or a research collective may be characterised by the interests, competencies, worldviews and scientific outlooks that a collective of researchers have in common (Törnebohm, 1985).

Socialized paradigm analysis

The above examination makes it clear that we have to further extend our understanding of the paradigm concept for it to be an effective aid in disciplinary reconstruction. Especially, we need to implode the distinctions inherent in previous concepts between 'internal' and 'external' drivers of disciplinarity, e.g. implicit distinctions between cognitive and social factors, between pure and applied, knowledge and value, and between science and society. Concepts going beyond these dichotomies are for instance Galison's (1997) 'trading zone', Nowotny et al.'s (2001) concept of strong, middle and weak contextualisation, as well as Latour's (1991) actants.

These concepts allows us to address the paradigm-discipline as a hybrid nexus for the production of knowledge, value and sociality, or as a 'knowledge-value-network' encompassing a learning component which ties to the social as well as the goal driven and cognitive aspect of academic endeavour. In knowledge-value-networks knowledge and value are not seen as distinct, but as two different sides of the same phenomena. Knowledge is potential value and value is actualised knowledge.

From this follows some important and radical shifts in the understanding of disciplinarity. For example we shift to a pragmatic or value based understanding of knowledge and sociality (e.g. Rorty, 1983). This non-representational understanding sees knowledge as created through trustful actions based on risky expectations of the future. The process of discipline development is based on learning in the knowledge-value-networks, especially when new boundaries are created and transgressed. Constructing boundaries in social reality make learning possible because it produces a

new outside environment that the actor – through transgression - can gain new knowledge about. With this more complex picture of knowledge-value-networks in mind we may proceed to attempt a disciplinary reconstruction of a specific post-academic research institute. To this end we have applied the broader insights of the knowledge-value conception elaborated above together with the analytical categories suggested by Törnebohm's (1985) paradigm concept. Because of the level of analytical detail and broadness in scope this concept appears to be especially well suited to grasp the disciplinary complexity of post-academic research. In what follows this concept will be applied to reconstruct a disciplinary identity for a post-academic research collective, that neither falls back on the highly simplified and rationalized disciplinary image of 'normal science', nor end up simply being a litany of disparate items of 'user relevance' without any critical academic core.

The present study

The empirical focus for this analysis is a virtual research institute (Institute for Management of Innovation and Technology – IMIT) located physically at three of Sweden's largest universities, but encompassing researchers from all over Sweden including Finland and Denmark. The institute engages in cooperative projects with industry and public bodies, in the area of technology and innovation management. It is completely dependent on external funding for its existence, and has grown into filling a dual role for its members, as an administrative vehicle for managing projects as well as an intellectual community of practice. The goal of the study was to ascertain whether a paradigmatic foundation or emerging 'discipline' could be reconstructed for the institute. In order to do this the authors analysed 10 years of abstracts for research project conducted at the institute, and thereby applied

Törnebohm's paradigm concept as an analytical prism. The picture that emerged from this analysis is presented below.

The case organization

Each of the paradigm components of *interests*, *worldview*, *scientific outlook* and *methodological commitments* will be represented by 10 positions taken, or foci adopted, in a 'typical' IMIT project. These have been derived from of a project descriptions spanning 10 years, and may be said to be representative of this material by dint of abstracting out specific characteristic notions and approaches than run through most of the projects. The *competencies* component has been omitted in this analysis, because of the difficulty of assessing competence profiles on the basis of the project descriptions. However, a reading of the faculty description of IMITs annual faculty catalogue reveals that there is a broad mix of social scientists and engineers represented, with an emphasis on industrial engineering, management and work psychology/sociology. Also, *methodological commitment* has been abstracted out from *scientific outlook*, since it forms its own coherent descriptive category in the empirical material.

Interests

This paradigmatic category was represented by the following characteristic research foci (or 'research interests'):

- Understanding and improving change processes in the product development organization of a manufacturing company.

- Describing key limitations of construction and production processes in a whole business sector.
- Better understanding ‘puzzling’ social and technological processes that hamper organizational innovations processes.
- Design new organizational forms for learning between organizations.
- Deepen the understanding of how work organization, competencies and salary systems affect business development in a manufacturing company. Create contacts for future cooperation between company, union and academe.
- Map the competence development strategies of foreign (Italian) small enterprises, and pinpoint corresponding regional support systems.
- Assess the effects of the geographical distribution of an organization on the work patterns of its members, especially the way that distance work affects professional work groups and leaders.
- Understand the consequences of merging different product development paradigms, for instance when hardware and software are to be integrated in the design of new cars.
- Identify key aspects of the co-evolution of knowledge creation, renewal and long term growth in young medium sized technology based companies.
- Appreciate in a number of cases whether management consulting actually contribute to learning and regeneration in organizations.

Appraisal: The interest component reveals an emphasis on understanding the dynamics of various organizational change processes. This understanding is influenced by problematic developments in the ‘research object’ and its environment. The research focus retains an emphasis on ‘basic’ social and technological processes,

but is at the same time strongly guided by values. These values pertain to a problem solving interests that sometimes emphasizes corporate 'growth' and, sometimes political (e.g. regional) and/or human interests (e.g. work place improvements, unions etc.). There are also examples of more critical research interests (e.g. the study of management consulting).

Worldview

This paradigmatic category was represented by the following characteristic perceptions of core features of the researched reality:

- Increasing tension between individual/human and managerial/organizational systems implies new demands on leadership.
- The external context of many organizations is increasingly high paced, which creates dissonance between internal abilities and external demands.
- Actors in programmed environments (e.g. in project organizations) respond 'ad hoc' to external demands, and the system thereby loses important learning effects.
- New external demands on companies create certain paradoxical dilemmas in the innovation process, for instance developments in regulation are sometimes more complex than technological innovation.
- A broadening of employee competence and the integration of work processes lead to a decline of the boarders between union and corporation.
- Regional networks of small and medium sized companies spontaneously develop beneficial competence support systems (that may be studied and generalized).
- Telecommunication solutions create new geographical patterns of corporate distribution, which correspond to changing, 'virtualized' work practices.

- There is a fundamental difference in the 'logic' of certain forms of product development, and these logics are increasingly collapsed in industry.
- There is a potential conflict between work specialization and generalization, which is in turn connected to the relationship between innovation and efficiency.
- When line managers are laid off, the responsibility for renewal and knowledge creation is (problematically) transferred to management consultants.

Appraisal: The basic assumptions about the researched world concern to the pervasiveness of environmental complexity, the challenging of human made systems boundaries (e.g. between a company and its various contexts) and the boundedness of the rationality of actors involved. This worldview typically involves an appreciation of multiple causalities, very dynamic interaction patterns and many interacting levels of reduction (e.g. between individuals, management systems and regions). Management is often seen as an activity 'on the boundaries' between different systems and rationalities. As several such systems or 'logics' are collapsed, management is challenged to confront social and epistemological paradoxes, and to create beneficial synergies out of these encounters.

Scientific outlook

This paradigmatic category is represented by the following examples of scientific outlook or of imperative notions as to what inquiry should focus on:

- Create knowledge about dynamic organizational processes for the purpose of facilitating intervention and change.

- Represent complex development patterns in such a way that many stakeholders in the organization can use these representations.
- Create organizational forms and concrete points of reference for knowledge sharing.
- Produce knowledge about the state of affairs in different branches of business through comparative analysis.
- Capture international best practice and transfer 'actionable knowledge' to decision makers involved in human resource management.
- Capture the effects on organizations of a 'spontaneous' societal development (e.g. convergence in telecommunications).
- Create an understanding of how different merging 'development logics' affects cooperation in projects.
- Improve the possibilities for commercial effectiveness through knowledge of a pervasive social dynamic in technology and knowledge creation.
- Critical analysis of knowledge creation and rhetoric in a service sector.

Appraisal: With regard to scientific outlook, there is a preference for research to focus on local effects of larger societal processes, often in the form of impact studies. Notions of local and global utility affect the research focus, but not necessarily or even preferably in the sense of 'profit maximization', although the creation of some form of value often takes precedence in focusing the research effort. Research in this regard is actor oriented (individuals, groups, organizations, policy makers), and the focus is on understanding for the purpose of improving the conditions for one or several of these actors. Research is thus directed at issues that make sense from a certain actor's point of view, and it is typically oriented towards critical knowledge

transfer, rather than interventionist (e.g. researcher acting as practitioner). In this sense the scientific outlook often combines an instrumental and a critical-communicative perspective with that of understanding.

Methodological commitments

This paradigmatic category was represented by the following examples of methodological commitments, i.e. how one should work practically with the research questions:

- Multiple case studies of key processes in companies of a particular branch. Emphasis on detailed, thick descriptions.
- A combination of interviews, questionnaires and model construction.
- Strongly selective, illustrative case studies.
- Organization building. Quasi-experimental approach.
- Comparative case studies of one business sector in two different countries.
- Empirical survey through selective interviews (convenience/relevance sampling) of business people and policy makers on the question of a proposed intervention.
- Multiple, comparative case studies combined with a broad questionnaire survey of different companies (variation in business area and size) with regard to one particular issue.
- Participant observation and 'trailing' or following around of key actors. Repeated deep interviews.
- Focus group discussions combined with simulation of a hypothetical case in a group of practitioners.

Appraisal: Methodological commitment is towards mixed methodologies and triangulation of methods, with a strong emphasis on case studies. Case studies tend toward giving prominence to illustrative and communicative criteria, and local validity and reflection are important. There is a range of approaches, from the traditional questionnaire surveys that satisfy conventional methodological criteria, to more experimental, emerging research styles found in 'softer' forms of social science (e.g. anthropology and organization studies).

The 'discipline' of post-academic science: Paradigmatic reflections

The concept of discipline as a 'tunnel of inquiry', where researchers work on a set of problems under a fixed framework relatively isolated from other such 'tunnels', has been shown to be insufficient in numerous studies, even for traditional disciplines such as physics and chemistry (e.g. Golinsky, 1998). Instead disciplines are increasingly viewed as ever-changing frameworks that organize various forms of academic activity, e.g. teaching, inquiry, careers and resource attraction. Disciplines are not easily characterized by reference to 'hard' and 'soft' qualities (Becher, 1998); various forms of discourses (critically examining, data gathering, externally focused) may proliferate at different phases during the life of a particular research program, and it is hard to historically reconstruct any regular stages that such programs 'must' pass through on their way to 'mature' status (Guntau and Laitoko, 1991). In historical inquiry these phases rather turn out to be articulated as part of the rhetoric of discipline formation *qua* language game and power struggle.

In this sense, and as suggested by the above case, the paradigmatic foundations for a purposeful and historically persistent academic activity need not be preceded by any coherent theoretical framework, language or even package of

research practices. Rather it may be viewed as a communal and highly abstracted 'thought style' (Fleck, 1979) of a research collective, who interact within a professionally and reflexively derived problem matrix. It is thence not the traded down and shared 'stock of knowledge' that determine the paradigmatic discipline of a research collective such as IMIT's, but rather an evolving need to address certain cognitive and social problems which emerge among a group of professionals, and where problem choice itself is guided by a reflexive mix of expedience and academic ethos.

The IMIT case may be instructive in the sense that it actively disengages from traditional disciplinarity, yet retains a 'discipline' in the sense of academic and socially responsive constraint around a number of issues, stakeholders and ways of working. IMIT is thence indicative of a particular discipline that leads its members towards certain ways of doing research, places to engage in research activity, and of speculating. Good (2000) has referred to such ever changing but yet disciplined frameworks of inquiry as 'assemblies'. The case of IMIT may be said to have explored a fairly coherent assembly of problems, worldviews, tools, interest groups and institutional forms supporting academic action.

The originality and integrity of this particular assembly cannot be analytically delimited in any obvious way. It is nevertheless restricted in practice by the way the IMIT research collective act as 'bricoleurs' in Levi-Strauss' sense, i.e. the way that they work from "…a set consisting of theoretical and practical knowledge, of technical means, which restrict the possible solutions" (Levi-Strauss, 1966, p. 19). But it is at the same time clear from the paradigm analysis of IMIT that these bricoleurs are also driven by certain ethical/reflexive principles of academic engagement. These aspects of the post-academic paradigm are not given even by the

most open-ended definition of disciplinarity, but rather concerns ‘discipline’ in the sense of what it means to be virtuous as a researcher when a number of stakes outside of the purely academic ones are considered.

As is visible from the analysis, IMIT *qua* post-academic research institute occupies a place in between various interests (academic and practical), scientific outlooks (understanding and engaging), worldviews (mechanistic and organic) and methodologies (‘soft’ and ‘hard’). Still, it is also clear that IMIT is not ‘everywhere and nowhere’, but retains a profile which allows a ‘disciplined’ inclusion and exclusion of topics. How does this come about? Going back to our initial account, a disciplinary paradigm in the traditional sense may bee seen as a consensual language through which problems are formulated in order to receive theoretical significance. Problem formulation here is theory-driven (Kuhn, 1969). The discipline of post-academic science as exemplified by IMIT, instead turns out to be a matrix of problems connected to professional conduct in a broad sense, which facilitates synchronization and communication among researchers and practitioners. This coordination of belief and action resembles what Galison (1997) refers to as a “trading zone”; a state where it may be difficult if not impossible to distinguish between researchers and practioners, as various forms of theoretical and instrumental action interfoliates in non-obvious ways. Post-academic discipline is found in the problem generating and problem solving practices which emanate in these trading zones. Problems may thus seemingly originate in either academic or practitioner discourse, but are more often formulated in a broader community of professional practitioners who engage in problem solving of various forms, e.g. managerial (business leaders), ethical (politicians, social workers, planners), scientific/theoretical (researchers) and communicative (journalists, lobbyists). This community and its

specific commitment viz. acceptable conduct and problem orientation must form the basis for reconstructing a post-academic disciplinary matrix.

Conclusions

It would be tempting to suggest that the discipline of post-academic science is about successfully negotiating and maintaining the interfaces between forms of knowledges and interests, *without* compromising either the integrity of academic values or the integrity of the interests and problems to which these values are expected to contribute. However, one may also suggest that post-academic discipline simply means that the researcher flexibly adapts the academic framework *qua* bricoleur, while maintaining a non-exclusory communicative ethic with interested parties inside and outside of academic discourse. This in turn implies not 'reducing' stakeholders to research objects, but rather to take them seriously as contributing members in a research collective. It also implies being willing to negotiate and re-negotiate the borders of this collective. To a post-academic research collective, these features form a 'robust institutional framework' akin to a discipline in the traditional sense but, as argued above, with a more realistic account of the open-ended growth of knowledge, self-renewal and social accountability.

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