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# Institutional work in academic technological facilities: A multi-case study from the field of biotechnology in France

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## ABSTRACT

*Purpose and design:* During this financially challenging times, public labs receive government funding to create technological core facilities (TCFs), which offsets the obligation to be open to any users. In the context of Gradual Budgetary Autonomy of Universities, academic TCFs are the object of multiple institutional demands (public service mission: training, world-class research, and revenue-generating commercial activity) that can be potentially contradictory.

This article has two objectives: (1) to identify the different institutional demands at play for technological core facilities and the tensions that this could give rise to and (2) to identify the different ways in which these tensions are addressed, illustrating the institutional work of the manager. With a qualitative analysis, ten institutional demands are identified, some of them are potentially contradictory.

*Findings and practical implications:* The ways in which demands are balanced help us underline three institutional works made by academic facilities directors; “conciliatory,” “academic research focused,” or prioritizing “research support.” In the studied cases, there is a clear link between the TCFs’ founding legal structure and this institutional work. By contrast, the TCF size, the capability of the manager, scientific domain, and current equipment do not differentiate response strategies with respect to institutional demands.

In financially challenging times, universities need to define precisely the different missions of TCFs and their potential complementarities, and they also need to be consistent in the selection of their legal form. At the end, this strategic vision of the TCFs activities appears to be a central issue for the university to improve its research and transfer activities.

*Originality/value:* The multi-level approach – institutional, organizational, and agency – gives account of the clearly contradictory nature of the institutional demands. These contradictory demands make possible an institutional work, and three possible trajectories of the TCFs could be identified. For each of them, a specific legal structure of TCF is highlighted.

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## 1. Introduction

Technological core facilities (TCFs) are technological platforms defined as “technological building blocks, that act as a foundation on top of which an array of firms, organized in a set of interdependent firms, develop a set of inter-related products, technologies and services” (Gawer, 2009). More specifically, academic technological core facilities (ATCFs) are up-to-date instrumentation associated with competences, available to academics and to industrials in order to perform scientific research (Peerbaye & Mangematin,

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2005). ATCF differs from a classical laboratory in that its equipment must be made accessible to both academic and industrial communities. In a knowledge-driven economy (Powell & Snellman, 2004), ATCFs have become central devices for the research and transfer activities.

To date, the literature on TCFs has focused on three major issues. The first of these seeks to develop TCF typologies based on the characteristics of their business portfolios. The second issue incorporates the time dimension to try to account for the trajectories of public and private TCFs and their complementary nature. These two approaches are organized, more or less explicitly, around the scientific and technological life cycles of research activities (Paradeise, Peerbaye, Aggeri, Branciard, & Le Masson, 2010). The final issue focuses on the sustainability conditions of TCFs. It enlarges the scope of analysis by striving to link the “scientific and technological life cycle” of projects, market segments, and “business models” with the study of conditions for sustainability (Peerbaye & Mangematin, 2005).

However, as underlined by Perkmann et al. (2013), research on academic engagement has rarely addressed the role of institutional environment demands. Such demands are potentially divergent because they are based not only on public values (higher education teaching, world-class research) but also on new principles linked to budgetary restrictions (commercial activity, profitability).

The two main objectives of this paper are to identify precisely the different institutional demands at play and potential tensions they could give rise to, and the different TCF response procedures illustrating the institutional work of the TCFs managers. The research focuses on biotechnology TCFs with government-funded equipment, located on a university site. In this domain, a research–industry relationship is the most common one (Ebers & Powell, 2007; Powell, White, Koput, & Owen-Smith, 2005).

With a qualitative analysis ten institutional demands are identified, some of them with potential conflicts. Three ways of institutional work given by academic TCFs in Brittany Region (France) are underlined and suggest research avenues for differentiating factors which will allow us to predict the different response strategies.

## 2. Technological core facilities strategies in response to different institutional pressures: the contribution of the institutional work concept

### 2.1. Conceptual background

In a context of open innovation, it is more relevant to apprehend the university in term of pool of competences in interaction between public and private actors, in order to transfer an actionable knowledge, rather than seeing it as a simple place of creation and capitalization of knowledge (Etzkowitz & Leydesdorff, 2005; Etzkowitz, Webster, Gebhardt, & Cantisano Terra, 2000). Technological core facilities underline this change in the university's role.

Numerous studies have focused on identifying factors that can hamper the universities' collaborative and entrepreneurial practices such as cultural barriers, assessment criteria of academics, or academic rewards (Lee, 1996; Siegel, Waldman, Atwater, & Link, 2004). These different studies can be mainly related to empirical approaches. To address an issue of fragmentation of these studies, some authors suggest empirical integrative model. Thus, Bozeman, Fay, and Slade (2013) propose a synthesis of these studies around three poles functionally connected: the “research collaboration attributes,” the forms of outputs (knowledge focus vs property focus), and the impacts of the transfer. On the other hand, Perkmann et al. (2013) underline three different levels of analysis explaining the academic engagement with other stakeholders, which are the individual, organizational, and institutional levels.

Among all of these studies, one issue remains unanswered. This is the resolution of the “embedded agency” (Lawrence, Suddaby, & Leca, 2011) paradox, that is to say the understanding of how some actors, under the pressure of their institutional environment, are however able “to play” with this environment, selecting or opening through their own arbitration, new options.

By considering the new institutional approach focusing on responses to institutional demands (Crilly, Zollo, & Hansen, 2012), and more precisely the institutional work (Lawrence et al., 2011), we are able to gain insight into this question in the case of the technological core facilities.

### 2.2. Existence of potentially divergent institutional demands

Although the theory of new institutionalism (DiMaggio & Powell, 1983) is often associated with the idea of organizational homogeneity, it also helps to explain heterogeneity. In their pioneering research, DiMaggio and Powell (1983) envisaged the life cycle of a field, recognizing that an emerging field (Maguire, Hardy, & Lawrence, 2004) is initially comprised of diverse organizations (DiMaggio & Powell, 1983). This organizational heterogeneity is justified by the presence of newly established institutions (Lawrence, Hardy, & Phillips, 2002; Maguire et al., 2004) and the absence of a leader to imitate. Under these conditions, each organization responds individually to the “institutional demands” to which it is subject (Pache & Santos, 2010) and thereby reinforces the heterogeneity of the field's core institutional arrangements (Battilana, Leca, & Boxembaum, 2009).

For a mature field – characterized by the presence of dominant actors disseminating demands and practices that organizations have already accepted – an institutional change (Greenwood, Suddaby, & Hinings, 2002) may be initiated to modify the existing rules. An institutional entrepreneur (DiMaggio, 1988) with a strong strategic vision can initiate a divergent change. This situation leads to field fragmentation (Pache & Santos, 2010) in which new institution practices are disseminated.

Thus, in both emerging and mature fields, a plurality of (more or less established) institutional demands is possible and contradictions between them are highly likely to appear (Battilana et al., 2009; Pache & Santos, 2010).

### 2.3. Institutional work as a response to divergent institutional demands

Responses to multiple, and potentially contradictory, institutional demands fall under the concept of “institutional work,” which is defined in the seminal article by Lawrence and Suddaby (2006) as “the purposive action of individuals and organizations aimed at creating, maintaining and disrupting institutions.” This concept acknowledges the enhanced role of institutional actors by going beyond the implementation of a divergent change by an institutional entrepreneur (Battilana et al., 2009) to integrate the creation and maintenance of existing institutions. This opportunity to respond to institutional demands, which lies at the core of the concept of institutional work, had been developed in the 1990s by Oliver (1991), who highlighted a range of responses: acquiescence, compromise, avoidance, defiance and manipulation. Oliver (1991) acknowledged the opportunity for an organization to dismiss certain demands. This range was extended in 2008 by Oliver and Holzinger when they proposed four types of response strategy available to organizations to effectively manage their political environment: proactive, defensive, anticipatory, and reactive.

To conclude, the concept of institutional work allows an organization to formulate a response strategy to the institutional demands of its environment. In this conceptual framework, the diversity of academic TCFs can be studied through the institutional work of the TCF manager.

### 2.4. Study model and research proposals

A three-stage model was chosen for this research. The first stage consisted in exploring the diversity of institutional demands that the academic TCFs had to meet. The academic TCFs involved in the study share a common environment in which not just one but seven institutional parties were identified: (1) legislators, (2) the government, (3) regional and local authorities, (4) research personnel (supervisors and highly technically qualified staff), (5) universities and research organizations, (6) users, and (7) IBISA,<sup>1</sup> the national coordinating mechanism for life science TCFs. Some institutional demands may be common to several parties. The second stage aimed to assess tensions between institutional demands. The third stage consisted in identifying response strategies to tensions – i.e., the TCFs models – illustrating the institutional work carried out by the TCF managers.

A study model was derived from the original conceptual model (Fig. 1), and two main research proposals (RPs) were then put forward. See Fig. 2.

RP1: The multiplicity of institutional directives at play in the organizational field of biotechnology TCFs is linked to a high risk of divergence between the demands of the said institutions (Battilana et al., 2009; Pache & Santos, 2010).

RP2: The divergence of institutional demands in the biotechnology sector opens up opportunities for strategic actions by TCF managers. In other words, when there is a greater degree of divergence in institutional demands, the convergence of organizational forms and of the TCFs managers' strategic options is less likely to happen (absence of isomorphism) (Battilana et al., 2009; Oliver, 1991; Pache & Santos, 2010).

## 3. Data and methods

### 3.1. Using a qualitative approach to operationalize the study model

In order to complete the different stages of the study model, a qualitative analysis was conducted, with semi-structured interviews. We limited our scope of analysis to TCFs on university sites in Brittany Region (France), which gave us 42 TCFs, 25 of which were in the field of biotechnology. Eight of these biotechnology TCFs were selected, and 11 managers were interviewed (4 research directors, 1 university professor, 1 senior lecturer, 2 research fellows, and 3 research engineers). These academic TCFs are also affiliates of French research organizations, such as CNRS. Interviews were also conducted with seven experts involved in TCFs activities. See Table 1.

### 3.2. Building knowledge through coding method

Our coding work followed two phases (Saldana, 2012) and was assisted by the use of Nvivo. The process is represented in the Annex 2.

#### 3.2.1. First cycle coding

The aim is to develop inductive codes grounded in the data. Rather than superimposing a set of codes over our data, this kind of coding allows the data to speak for itself. The analysis is solely based on what we see happening in it. To explore the institutional demands, an inductive thematic content analysis (Miles & Huberman, 1994) was carried out on the interviews given by the experts and the TCFs managers. This involved to clearly and immediately identify the categories referred to by the interviewees. We were looking for segments of data, which allude to incentives and prescriptions about work to be done. The identification of the institutional demands was also clarified by secondary data (regional innovation system report, progress reports, and IBISA charter) that further supported our approach (Table 3 and Annex 1).

<sup>1</sup> [IBISA (Infrastructures in Biology, Health and Agronomy) is a GIS (an organization of scientific interest) – the body that oversees infrastructures coordination in France.]

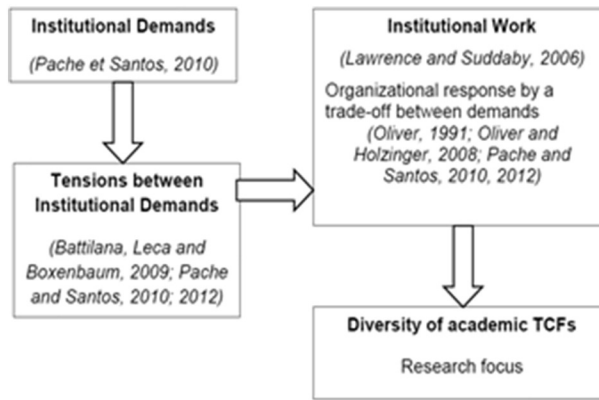


Fig. 1. Conceptual model of the article.

3.2.2. Second cycle coding

To identify potential tensions between these institutional demands, we applied a priori codes derived from a modelling of institutional demands in terms of flows. The aim was to highlight the different options available to managers (Fig. 3). A time dimension was integrated by distinguishing between the short and the long term because there can be contradictions between goals and means (time dedicated). Moreover, the findings of previous studies helped to strengthen the studied relationships (Peerbaye & Mangematin, 2005).

This allows to identify the institutional work carried out by each manager. We looked for segments of data illustrating the way the manager globally answers to all these tensions, and we examined precisely how managers prioritized the different institutional demands perceived. With this inductive process, we identify different types of institutional work (cf. Table 4).

This table (cf. Table 2) synthesizes how we passed from the concept to its measure, that is to say how we operationalized concepts.

Moreover, we verified that managers' statements converged with those of experts familiar with TCFs and their mode of function. To validate the coding of the interviews (identifying institutional demands and tensions, and analyzing TCF models showing the manager's institutional work), member checks were carried out in line with the recommendations of Thomas (2006). A focus group that included 3 of the 7 original experts (selected according to availability) also helped to validate the identification of institutional demands and tensions.

3.3. Three steps for identifying institutional demands and their potential contradictions

Step 1: TCFs are confronted to multiple institutional demands.

From the interviews, we identified ten institutional demands shared by the TCFs. These demands concern issues related to the following areas: (1) scientific challenges, (2) financial equilibrium, (3) training, (4) global competitiveness, (5) national competitiveness, (6)

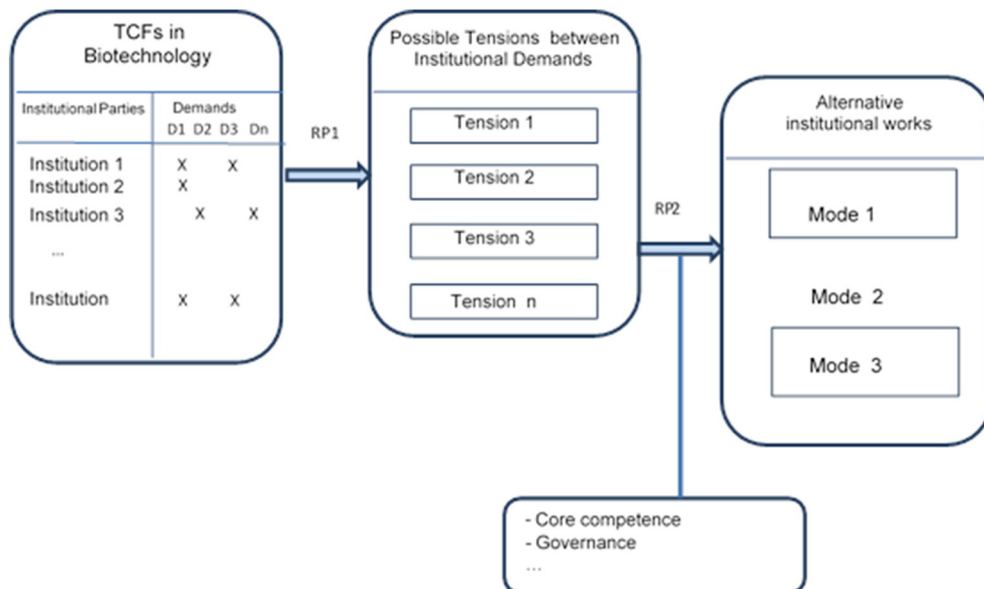


Fig. 2. Study model.

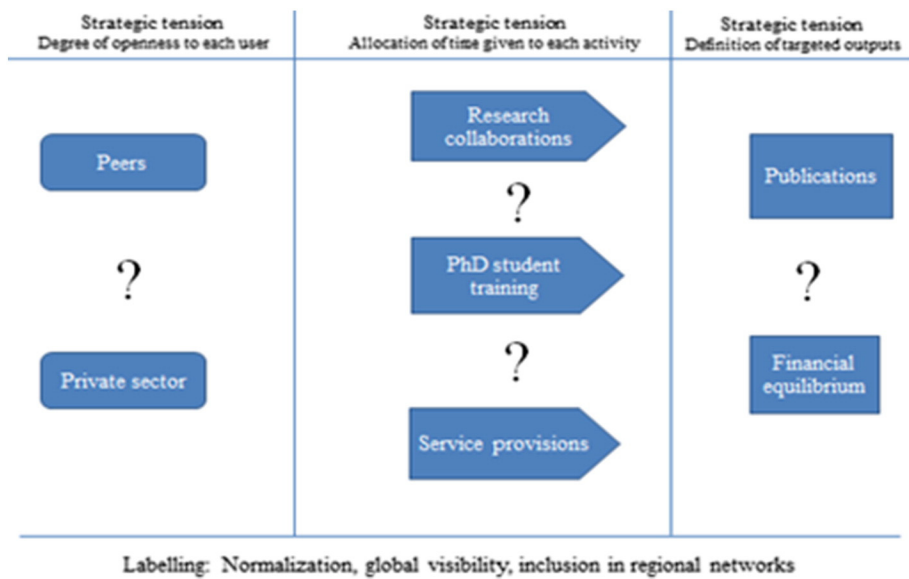


Fig. 3. Strategic options and associated outputs.

openness to other academic actors, (7) openness to private actors, (8) collaborative research partnerships, (9) service provision, and (10) the “professionalization” of procedures. They may be described as inputs (openness to peers and the private sector), processes (service provision, research collaborations and training), and outputs (publication and financial equilibrium). Global visibility, inclusion in regional networks, and labeling reinforce these processes.

There is no one-to-one relationship between demands and the seven aforementioned institutional parties (summarized in Annex 1).

Step 2: Potential tensions between these multiple institutional demands.

To examine potential tensions, it was chosen to model in terms of flows: each tension was analyzed according to the strategic option that would or would not be used (Fig. 3).

Fig. 3 summarizes the different tensions linked to the strategic options available to the TCF manager. A first tension involves the degree of openness to each user: peers (A6) or private sector (A7). A second tension involves the allocation of time to each activity: service provision (A4) and research collaborations (A5). PhD student training is classed as a cross-cutting activity that reinforces other activities, rather than as an option that can be selected to the detriment of another. As such, in an industrial agreement for training by research, PhD work must be associated with private sector research collaborations (A5, A7), publications (A1), and financial equilibrium (A2). For Bozeman (2000), university-trained students who carry out a work placement are an excellent way of transferring technology towards the private sector. The students can also participate in service provision (A4) and openness to peers (A6). A final tension involves defining the volume of desired outputs: publications (A1) and financial equilibrium (A2).

It must be noted that, in addition to all of the above, global visibility, inclusion in national networks, and the presence of standardized procedures are positively associated with different institutional demands.

Several pathways are therefore possible between the options, and the manager must come to a balanced decision. For example, publication is highly unlikely when the term of a service provision in the private sector comes to an end. If a manager's desired outcome is for published works, then he/she must favor research collaborations. On the contrary, if a manager's priority is to ensure financial equilibrium, then providing services to the private sector is the best choice. Services provided are billed at much higher tariffs than research collaborations: for the former, the study results remains the ownership of the sponsor and the tariff includes the direct and indirect costs of the services provided, and for the latter, these tariffs are negotiated according to the skills of the parties involved.

Table 1  
Description of TCFs and managers questioned.

N° TCF	Number of managers questioned	Manager status	Manager's organization of affiliation
1	3	Research directors	IRSTEA, INRA, CNRS
2	1	Research fellow	CNRS
3	1	Research engineer	INSERM
4	1	Research engineer	INRIA
5	1	Research fellow	INSERM
6	1	Research director	INSERM
7	1	University professor	University hospital
8	2	Research engineer senior lecturer	University

**Table 2**  
From conceptual assertions to coding process.

Conceptual assertions	From concepts to data	Coding process
Multiplicity of institutional demands	Segments of data which allude to incitations and prescriptions about work to be done	Inductive content analysis
Tensions between institutional demands	Options available to the manager	A priori codes derived from a modelling of institutional demands in terms of flows and the literature
Institutional work carried out by each manager	Segment of data which allude to prioritization of institutional demands	Inductive content analysis

Step 3: Institutional work of TCF managers.

The final stage involved identifying responses to institutional demands, which showed the institutional work carried out by the manager. In order to do this, institutional demands were assessed according to their priority for the manager (–: no priority; (–): low priority, +: priority, ++: high priority), as shown in Table 3 below. It can be seen that there are three major responses illustrating institutional work made by managers: research first and foremost (TCFs 1 and 6), conciliatory (TCFs 2, 3, and 5), and research support (TCFs 4, 7, and 8).

The way the manager prioritizes institutional demands enables to identify three types of institutional work.

**4. Results: an institutional work organized around three main responses**

4.1. Response 1: The “conciliatory” institutional work

This institutional work is common to TCFs 2, 3, and 5. It is characterized by a relatively good ability to reconcile different institutional demands. Research oriented with the objective of publication, these TCFs also foresee a commercial activity allowing end-of-year financial equilibrium to be achieved. The profits made ensure the TCF's longevity and financial resources for equipment maintenance and consumables, but also contribute to the recruitment of permanent staff.

“As far as we were concerned, the aim of the TCF was to conduct research, to establish links with the national or academic community, let's say. But bearing in mind the existing budgetary restrictions of the university and CNRS, and the cost of our machines, we wanted part of our services to become purely commercial. That's to say, to use this commercial activity to balance our budget and to finance the maintenance of our machines [...] Those commercial services are solely a way of bringing in money – money that goes towards the upkeep of the machines.” (TCF 2)

Peer exchanges are part and parcel of university culture. Openness to the private sector, for collaborations or service provision, is perceived as a significant source of financial revenue. From another perspective, these TCFs fulfill their objective to train PhD students, which, for TCF 2 in particular, enables research collaborations with the private sector to be carried out. Therefore, these TCFs can be qualified as “conciliatory.” They define the notion of “reactive” strategy (Oliver & Holzinger, 2008), which, in this case, materializes as a conciliatory approach. These TCFs try to actively align their internal processes with institutional demands. The present research highlights that the practice of “mimicry,” involving the coupling of new practices (service provision and openness to the private sector) with old ones (publications) that are taken for granted (Hargadon & Douglas, 2001; Jones, 2001; Lawrence & Suddaby, 2006), is made possible by divergent institutional demands. Here, the organizational response consists in designing a business model that can reconcile all demands, with substantial investment from the actors involved.

“At the end of the day, there's nothing wrong with bringing in money for the university if we decide to really go for it and work towards the professionalization of the TCF. An engineer who is funded by the Région is going to come and work on the TCF for two years and what I would really like her do is to bring in contracts with the aim of eventually becoming self-financed. We would then be able to offer her a permanent contract. And the same goes for the technicians. In the future, not only could these people be self-financed, but they could bring in money as well. We are definitely moving towards a professionalization of the TCF.” (TCF 3)

4.2. Response 2: The “research first and foremost” institutional work

This type of response is common to TCFs 1 and 6, which are characterized by a will to protect the public values of their activities: scientific excellence and openness to peers to permit publication. Conversely, they remain extremely polarized with regard to

**Table 3**  
Institutional demands.

Nature of demands	Content
Inputs	A6 Openness to peers A7 Openness to the private sector
Processes	A3 PhD student training A4 Service provisions A5 Research collaborations
Outputs	A1 Publication A2 Financial equilibrium
Labeling	A8 global visibility A9 inclusion in regional networks A10 normalization

**Table 4**  
Priorities given to institutional expectations depending on institutional work.

Tensions	Expectations	“Academic research” institutional work		“Conciliatory” “institutional work			“Research support” institutional work		
Core facilities		1	6	2	3	5	4	7	8
Inputs	Openness to the private sector	(+)	(+)	++	(+)	+	+	+	+
	Openness to peers	(+)	++	++	++	+	++	++	++
Processes	PhD student training	++	+	+	+	+	–	–	+
	Service provisions	+	+	++	++	++	++	++	++
	Research collaborations	++	++	++	+	+	+	–	–
Outputs	Publication	++	++	++	+	+	–	–	–
	Financial equilibrium	+	+	+	++	+	–	+	+
Labeling	Global visibility	+	+	–	–	–	+	+	–
	Inclusion in regional network	+	+	+	+	–	+	+	+
	Normalization	+	+	–	+	–	+	+	–

openness towards the private sector, which threatens to monopolize their time to the detriment of publications. Therefore, it can be said that the overriding objective of these two TCFs is for published works. There are two possible options for reducing this private sector service provision.

The first is to selectively choose an option (research collaboration with the aim of publication). The dismissal of other options (openness to the private sector for service provision) translates into “defiance” (Oliver, 1991) or “demonizing” (Angus, 1993) practices; the latter consists in demonizing the normative foundations of a rejected institution.

“Service provision [for the private sector] here – over my dead body! That’s not our job. We are researchers and research teams above anything else, and that’s what we’re being assessed on. So yes, we have carried out these types of commercial services in the past, so I know what I’m talking about. I got a telling off at the time, I can tell you! When the TCF first started, we were asked to provide services, so that’s exactly what we did. But then all of a sudden, they asked us “Well, what have you been doing for all these years? What has the team actually done? Service provision for the private sector (Servier, Sanofi, etc.) is all well and good, but where are the published works?” These people don’t produce anything. Since when has the pharmaceutical industry been known to write articles? “Well, in that case, you’ll have to stop straight away because it’s just not on.” So that’s exactly what we did. And that’s why we created a start-up company to generate real revenue from these services, without a scientific counterpart: the customer has exclusive ownership over the results. Our job is to conduct pure research, to publish our work (whether this takes the form of original articles or filing patents) and to promote our research from a scientific point of view. It’s not my job to provide services for the private sector, or even worse, in my opinion, to stoop to a kind of door-to-door selling. They’re asking us to go on courses to become sales reps. My job is certainly not canvassing for new clients and none of my colleagues are bothered about this kind of thing as it’s not their job either. Our place is in the research lab, not trying to drum up new business.” (TCF 6)

A second possible option to reduce service provision to the private sector is to implement a *modus operandi*, which, in theory, appears to respect the different institutional demands but in practice prompts the exclusion of service provision to the private sector. Therefore, for TCF 1, access for the private sector is limited by a steep increase in tariffs. This response, which we qualify as a “tolling strategy,” is made possible by the specificity of the TCF’s research field and the absence of a competitor. In fact, the use of equipment giving out ionizing radiation requires authorization from the nuclear safety authority, which limits the number of people in the country who are authorized to do such work. As a consequence, this TCF has finished by being the only offer present on the market. As there

**Table 5**  
Links between institutional work, equipment, human resources, and TCF founders.

	Academic research		Conciliatory			Research support			
TCFs	1	6	2	3	5	4	7	8	
Number of staff	6	13	40	6	5	10	23	5	
Manager status	Research director	Research director	Research fellow	Research engineer	Research fellow	Research engineer	University professor	Research engineer	
Scientific field	Bio-imaging	Post-genomics	Dating	Bio-imaging	Animal rearing	Bio-imaging	Living samples	Physical measures	
Main equipment	MRI NMR spectrometer	Mass spectrometer	Mass spectrometer	Micro-dissection laser	Specialized premises	Servers, Calculation centers, stocking zones	Bio-bank software stocking zones	Mass spectrometer NMR Elemental analysis	
TCF founder	Research unit	Research unit	Joint service unit (UMS)	Joint service unit (UMS)	Joint service unit (UMS)	Public scientific and technical research establishment (EPST)	University hospital	Public higher education establishments for sciences, culture, and vocational training (EPSCP)	

are numerous requests, openness to the private sector relies on potential profit and the ability to pay. The manager also uses staff shortages to justify this position.

“At the moment, we're the only ones on the market – all of our competitors are either dead or they've thrown in the towel. When it comes to research in this field, there's only us. I don't even have to chase clients any more – they come to me. All we have to do is to manage the priorities and when it becomes a little bit difficult, it's according to the amount of money that the client offers. For example, the other day, someone from industry urgently needed us to do a job, so I said OK, but it will be four times more expensive than usual. That's it.” (TCF 1)

On top of increased tariffs for the private sector, openness to the public sector is also restricted by the compatibility of requests with the TCF's research themes.

“Overall, because we can't hire any more staff, since 2012 I have been refusing any research that deviates from our Unit's fundamental study areas. [...] Anything that doesn't fall under our core research activities can go. It's true that, unfortunately, we are moving further and further away from the original concept of a TCF.” (TCF 1)

Finally, for TCF 1, openness to the private sector is profit-related, and for the public sector, it is restricted to the TCF's research themes, to ensure publications. As a result, this TCF is not truly open. It mainly meets the needs of the research team and not those of the users. This second strategic option confirms Oliver's analyses (1991) on “avoidance by concealment” strategies. By hiding behind an acquiescence façade (Abrahamson & Baumard, 2008), or a non-conformity to institutional demands, the TCF can shield itself from conflict with its environment.

#### 4.3. Response 3: The “research support” institutional work

This type of response is common to TCFs 4, 7, and 8. They define the rules of pooling resources (TCF access protocol, tariffs, etc.), enabling them to position themselves as a research support. As such, publication is not their overriding priority. For example, TCF 4's objective is to provide a bio-informatics environment. For TCF 7, its aim is to receive, prepare, and stock collections of human biological samples, collected from patients in clinics (tumors, tissue, blood, etc.) – not to further the diagnostic work, but to make it available to a community of researchers. Finally, TCF 8 is a service center carrying out public and private service provision that needs special equipment to conduct measurements and tests, etc.

“It's much better to have a centre with pooled machines that saves money all round, not only for the tax payer, but also for scientists, chemists and physicians who won't have to don the technician's hat and do the work themselves. Getting engineers to do the job for the scientists means that everything will be a lot more specific and efficient.” (TCF 8)

TCF 4 does not charge for the provision of its bio-informatics environment. Above all, this type of TCF aims to support research with service provision (provision of equipment and samples, analyses) and less often, to carry out research collaborations (as is the case for TCF 4). Moreover, the managers of TCF 4 and 8 are not assessed on their publication output, which is not included in their job description. These research support TCFs eliminate one of the institutional demands: publication. This strategy involves exiting the field with the pressure to conform through modifying objectives or activities. In practical terms, the actors involved in these TCFs have defined a specific mission out of different institutional demands by bypassing the need to conform to all pressures. These TCFs are all characterized by an “expanded” position, one which is atypical. It displays a “strong identity” which is selective, based on transversality and service provided to multiple units, as highlighted by Lounsbury and Glynn (2001).

## 5. Discussion

### 5.1. Possibility of institutional works faced with institutional demands

The coding of the interviews highlighted three different ways in which institutional demands are balanced: conciliatory, academic research above all, and research support. These are different responses to institutional demands and show the institutional work carried out by the TCF manager. Our study model and the research proposals provided enabled us to formulate the following propositions:

**Proposition 1. :** *The higher the number of institutional demands in a biotechnology field, the greater the risk of incompatibility between these demands. This situation is represented in the field of biotechnology TCFs insofar as there are more strategic options to choose from when there are a higher number of demands.*

**Proposition 2. :** *A greater degree of diversity of institutional demands means that the convergence of the organizational forms used by the TCFs managers is less likely. This situation is supported as the analysis established three kinds of institutional work mobilizing different strategic option in the field of biotechnology.*

### 5.2. What factors might contribute to the institutional work?

We identified two different conceptual approaches that would provide a more in-depth understanding of the common responses shared by TCFs with the kind of institutional work. Therefore, an institutional work approach lies at the crossroads of two other approaches: (1) a strategic approach based on core competence (Hamel & Prahalad, 1990), which is connected to the existence of specific active elements, and (2) a behavioral law and economics approach that develops the modern property rights theory (Blair, 1995)



on the role of law in governance. In the case of the present research, this involves studying the relationship between the institutional work and the legal form of the TCF in question.

First, it must be noted that there is no clear link between each institutional work and the specificity of the TCFs' active elements (equipment and human resources), as shown in the Table 5 (see above). The TCF size, capability of the manager, scientific domain, and current equipment do not differentiate response strategies with respect to institutional demands.

On the other hand, there is a clear link between the TCFs' founding legal structure and the institutional work. "Research above all" TCFs were founded by Research Units, thereby justifying the overriding priority given to publications. Conversely, "research support" TCFs contrast with research units in that they all stem from one or two non-federated or independent organizations: this accentuates the will to create a common services center. Finally, the conciliatory TCFs belong to the joint service unit type, federating several units from different organizations.

These joint units and the different founding organizations must mutually agree on the common TCF missions, which would appear to tie in with the "conciliatory" institutional work of the TCFs concerned.

### 5.3. Managerial implications and limitations

When faced with the diversity of institutional demands and their potential contradictions, the degree of strategy hybridization varies according to TCFs. The three ways in which strategic options are balanced reflect the institutional work of the manager. In terms of managerial implications, legal structure and associated governance may be coupled to the strategic options used by managers, according to the options made available by the institutional demands. The TCF's founding legal structure is a real practical stake when it directly calls into question the strategy to be implemented by the university regarding the housing of equipment in order to stimulate their openness with regard to different skills. In a difficult economic climate, it is in universities' best interests to cover upkeep of the equipment by sufficient openness to users.

From a practical perspective, it would seem preferable to favor type 1 and type 3 structures that offer complete pooling and cross-cutting services to several research teams. These legal structures (Joint Research Units or the University) offer access to multiple skills. It is likely that a type-2 TCF, whose main focus is research and which therefore has restricted openness, will not be viable in the long term without recurrent government funding. However, scientific promotion is undoubtedly the best way forward in this type of institutional work and remains a key factor for a university's visibility.

This research has some limitations. The 18 in-depth interviews were only carried out in TCFs located in Brittany Region (France) to ensure that they had a similar institutional context. Nevertheless, TCFs in other regions with different government mechanisms will not necessarily have the same responses to institutional demands. The list of institutional work should in no way be considered as exhaustive.

### 5.4. To go further with institutional work

#### 5.4.1. To improve the understanding of institutional work by integrating more variables

Future studies must first introduce more variables that can influence the institutional work. Among them, we can cite the form of governance (Westphal & Zajac, 2013) with a specific focus on the role of the different committees (scientific, users, etc.) stressing on their effective or façade roles (Abrahamson & Baumard, 2008). This would enable specifying the modes of performing institutional work and would respond to the challenge posed by Lee (2011) on the interest of coupling "institutional work" and "stakeholder" approaches. It is also important to assess in more details the function in facilitating or limiting the institutional work of the legal forms of the technological core facilities. Indeed, the organizational forms (in terms of structure and legal status) is likely to influence the quality and quantity of outputs, so that some organizational can be more widely adopted than others (Lawrence et al., 2011).

The analytical framework proposed could be extended to other institutional contexts to ascertain the convergence or non-convergence of institutional demands according to countries, and the similarity or difference between TCF managers response modes.

Finally, it would be fitting to analyze the correspondence between the characteristics of the TCF manager and the strategy chosen for the TCF, following studies led by Gupta and Govindarajan (1984). This type of study would respond to the issue raised by Battilana and D'Aunno (2009) according to which "there is relationship between actor's agency and the characteristics of the organizations in which they are embedded," and it is unlikely that two individuals from the same organization will have the same probability of engaging in institutional work.

Examining these variables can help us ensure the robustness of our results with the convergence of the institutional around three configurations, but also to identify new configurations.

#### 5.4.2. Institutional work and the challenge of TCF sustainability

Future studies could also study the relationship between the institutional work and the sustainability of the TCF. In a context of economic crisis and scarce financial resources, rationalizing investments in equipment will be a new challenge for universities (Makkonen, 2013). Studying this issue will likely involve to change the perimeter of analysis of the TCF and to assess their complementarities in order to identify different types of business models (Baden-Fuller & Mangematin, 2013). This topic cannot be dissociable of a better understanding of the development paths of TCFs.

## 6. Conclusion

This work sought to study the links between three following levels of analysis: “institutional,” by identifying potentially contradictory demands according to the institutional sources retained; “organizational,” by studying the diversity of the TCFs’ business portfolio; and “agency,” by examining the institutional work of TCFs managers.

In this way, the “institutional work” approach enables the links between these three analytical levels to be explored.

This multi-level approach leads to the understanding that the apparent diversity of the TCFs noted at the macro level of a university or of a region, is in fact a “constructed” diversity at the micro level, stemming from “deployment and interaction spaces,” made possible by potentially divergent institutional demands. The paper contributes to identify the potential contradictions of the institutional demands, and the design of the institutional work around three main processes; the “conciliatory” institutional work, the “research first and foremost” institutional work, and the “research support” institutional work. The TCF’s founding legal structure appears also to be a real and strategic stake.

From a managerial perspective, having a better understanding of the different forms of institutional work can facilitate the definition of the competency profile of the person responsible for the TCF. The purpose here is to improve the level of professionalism of the recruitment and training procedures by identifying more clearly the strategic and managerial competences required by the TCF’s Director.

Considering what is at stake, under consideration the amount of investment of the TCFs and their roles in producing new knowledge (cf. for instance the European Research Infrastructure Programme, Horizon 2020 Framework Programme; <http://ec.europa.eu/programmes/horizon2020/en/h2020-sections>), the study of the TCFs and of their management should surely be a central issue for both policy makers and practitioners in the next years.

## Appendix Annex 1. Content of the different institutional demands

### A.1. World-class research leading to published works

In France, the National Council of Universities (Conseil National des Universités) oversees researcher career development, and the Agency for the Evaluation of Research and Higher Education (AÉRES) issues marks for Units and Universities for producing publications. Universities and IBiSA (via their charter), calls to tender for European and national projects (Agence Nationale de la Recherche, IBiSA) and the State-Région project contracts (CPER: Contrat de projets État-région), all have publication demands for academic TCFs.

### A.2. End-of-month financial equilibrium

The 2007 University Freedom and Responsibility Act (La loi relative à la Liberté et Responsabilité des Universités (LRU) de 2007) places responsibility with French universities themselves, and therefore, the academic TCFs, for reaching end-of-year financial equilibrium.

### A.3. PhD student training

The academic TCF is under the same obligation as the University as far as implementing a teaching mission (Article L. 123–3 of the Education Act (code de l’éducation)) is concerned. As such, it trains PhD students in the use of equipment. This demand is also disseminated by the IBiSA and University charters.

### A.4. Achieving global visibility

TCFs are urged to distinguish themselves by their expertise in order to increase competitiveness at the regional, national and global level. Labels (positive signals sent to all partners involved and which are accompanied by financial assistance) are also assigned by IBiSA or the French State under the Investments for the Future (Investissement pour l’Avenir) program.

### A.5. Inclusion in regional networks, with a level of national visibility

This applied to Régions wishing to achieve national recognition as a strong center in a particular domain. Networking activities are therefore carried out: TCFs are encouraged to participate in these actions in order to reach a certain level of coherence and visibility.

### A.6. Openness to peers

A TCF has to justify openness to its finance providers, contrary to a classical laboratory. This collaboration between academics is part of a common culture. The University and IBiSA charters, as well as the regional and local authorities that finance the TCFs, also favor this collaborative and resource-pooling work.

### A.7. Openness to the private sector

One university mission (Article L. 123–3 of the Education Act) is for knowledge transfer towards the private sector. This openness is encouraged by regional and local authorities as well as by the University and IBI SA charters. It also depends on the culture and the willingness of public researchers.

### A.8. Collaborative research partnerships

Openness is accompanied by collaborative research partnerships in which ownership rights are negotiated and shared between TCF users.

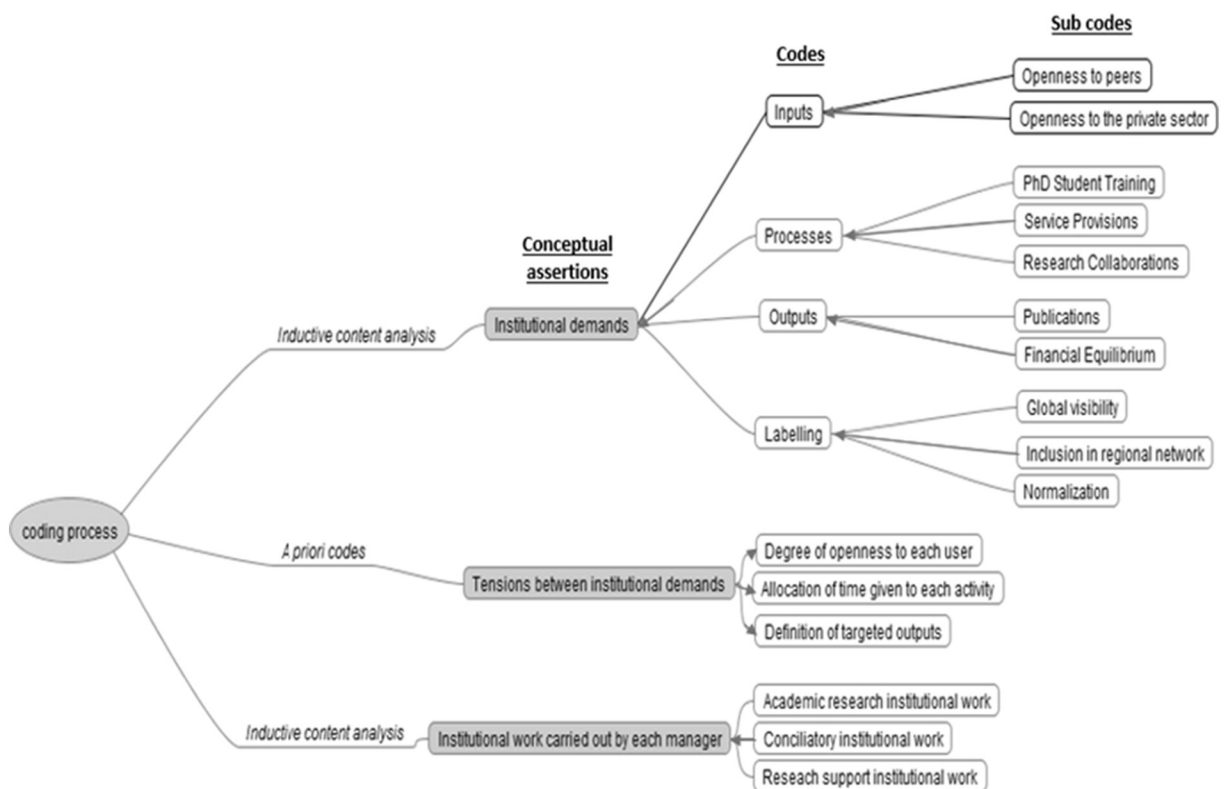
### A.9. Service provision partnerships

Openness may also materialize through provision of paying services: advice, making equipment available, simple or complex analysis. These activities should not create conditions of unfair competition with respect to private TCFs.

### A.10. Presence of clear and transparent procedures, indicator monitoring

ISO 9001 certification ensures that, for users, there is a professionalization of a TCF. Normalization of processes is advised under the University and IBI SA charters and can be an explicit demand of the users.

## Appendix Annex 2. Coding process



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