



ABSTRACT University Technology Licensing Offices (TLOs) are strategic sites for examining efforts to concretize, frame, and market early stage technologies. This paper draws on 18 months of fieldwork in a private university TLO to analyze collective decision-making efforts during licensing meetings. I describe three processes – docket description, deal framing, and problem resolution – that highlight the central roles that locally sensible strategies and languages play in describing and comparing disparate technologies. Such approaches reflect the collective experience of licensing associates and, when rationalized through organizational learning, represent the processual underpinnings of ongoing transformations in the institutional arrangements of US universities. Close examination of meeting discussions reveals multiple ‘conceptual spaces’ that support TLO decision-making and more closely connects theoretical work in science and technology studies with theories of organizational learning and with economic sociology’s growing emphasis on commensuration.

Keywords decision-making, institutional change, licensing work, university technology transfer

Dockets, Deals, and Sagas: Commensuration and the Rationalization of Experience in University Licensing

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In the wake of the 1980 Bayh-Dole act (Public Law 96-517), US universities rushed to commercialize academic research conducted with the aid of federal funding. The next 20 years witnessed transformations in the uses of academic science and engineering heralded by dramatic increases in university patenting, an explosion of licensing activity, and the emergence of a new professional group. Academic licensing efforts administered by the Technology Licensing Offices (TLOs), which now exist on all but a handful of university campuses, generated more than US\$1 billion in revenue in 2000. Work in TLO has also resulted in the prosecution of more than 20,000 US patents and the foundation of more than 2000 new corporations (Association of University Technology Managers, 2000). University technology transfer is, increasingly, big business.

The growth of TLOs marks a watershed for academic science and engineering. Scholars from multiple disciplines have recently turned their attention to academic technology transfer efforts in works emphasizing:

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alterations to the careers and practices of scientists and engineers (Kleinman & Vallas, 2001; Owen-Smith & Powell, 2001; Kleinman, 2003); transformations in the institutional arrangements that govern academic competitions for status and resources (Packer & Webster, 1996; Owen-Smith, 2003); shifts in academic contributions to state and national economic systems (Feller, 1990; Slaughter & Rhoades, 1996; Etzkowitz & Leydesdorff, 1998); and challenges to long-standing distinctions between the public and private domains that enable basic research efforts (Heller & Eisenberg, 1998; Nelson, 2004) and underpin conceptions of academic freedom and intellectual property (McSherry, 2001; Krinsky, 2003). While often less than sanguine about the changes they document, most scholars agree that research commercialization represents a transformation at the heart of academe.

TLO are important professional and practical loci for such changes. A survey of 142 US universities conducted in the year 2000 reported that all but 10 had initiated formal technology transfer efforts, and fully 37% ($N = 53$) had done so in the 1990s (Association of University Technology Managers, 2000). TLO are relatively new but important players in the elaboration of a hybrid university research mission that mixes commercial and academic rules for the production, dissemination, and use of scientific findings. Whether they are conceptualized as an integral component of a new university production function (Thursby & Thursby, 2002; Siegel et al., 2004), a locus of organizational learning (Mowery et al., 2001; Owen-Smith & Powell, 2003), or a site for active but often invisible boundary work (Guston, 1999; Kaghan, 2001; McCray & Croissant, 2001), TLOs offer a unique window onto the micro-processes that are reshaping the university and the relationship between science and commerce.

TLO are also strategic research sites at the intersection of science studies, economic sociology, and organizational theory, three literatures that have only recently begun to converge (cf. Callon, 1998; Vaughan, 1999; Owen-Smith, 2001). This paper draws upon 18 months (November 1999 to May 2001) of observational fieldwork in a private university TLO¹ to forge conceptual links between: (1) science studies' concern with the heterogeneously assembled and contingent character of facts and artifacts (Callon, 1986; Latour, 1987; Bijker, 1995); (2) organizational theory's focus on situated decision-making and the standardizing effects of organizational learning (March & Olsen, 1976; March, 1978; Powell, 1985); and (3) economic sociology's emphasis on the role commensuration plays in the construction and maintenance of contracts and markets (Espeland & Stevens, 1998; Levin & Espeland, 2002). Though seemingly far flung, these themes converge in my analysis of three processes in the TLO.

Licensing work occurs at the intersection of academic, policy, and market regimes (Guston, 1999). Technology licensing officers thus face complex and often contradictory pressures as they struggle to identify, manage, and market early stage innovations developed in the course of academic research projects. Though that work and its effects on organizational and institutional arrangements has largely remained invisible

(McCray & Croissant, 2001), the characteristic language and tools of TLO work harness and direct the universities' productive capabilities while maintaining a permeable boundary between the academy and industry (Kaghan & Lounsbury, 2004).

Collective efforts to define early stage technologies highlight the socio-technical dimensions that must be stabilized if innovations are to be protected by patents and transferred through licensing deals. Descriptions of technologies in TLO meetings illuminate the array of features that licensing professionals use to characterize and market inventions. The social and organizational arrangements that help to constitute technologies are rendered transparent in discussions of 'dockets': complex objects that might prompt licensing associates to agree that the objects of their work 'take their form and acquire their attributes as a result of their relations with other entities' (Law, 1999: 3).

The TLO's mission – '[T]o promote the transfer of "Elite Private University" technologies for society's use and benefit while generating unrestricted income for support of research and education' – highlights the contradictory institutional pressures inherent in academic licensing work. A mission that mixes identification and transfer of novel technologies with concerns about public benefit and revenue generation places the TLO's inhabitants squarely at the intersection of science and commerce. That position requires them: (1) to grapple with the complex, heterogeneous character of the dockets they assemble; and (2) to construct deals that will transfer technologies to market in a fashion that ensures both broad access and income that can be reinvested in Elite Private University (EPU) science. In more theoretical terms, the TLO's work encompasses the construction, maintenance, and translation of technological assemblages. Acts of definition and stabilization often occur contiguously with efforts to frame those socio-technical arrays as unitary and non-overlapping bundles of property rights, which are transferable through contracts (Callon, 1999).

Defining dockets and doing deals overlap in TLO work and both processes rely on a similar constellation of socio-technical features. But framing and deal-making efforts are necessarily imperfect. Changing situations and mutable technologies throw up complicated problem cases, which TLO associates call 'sagas'. Resolving such problems is a key concern for the office. Efforts to manage sagas often encompass both the renegotiation of deals and the reassembly of dockets.

Sagas are reported in meetings where their resolutions emerge through a process of collective sense-making (Weick, 1995). Discussions draw comparisons along multiple dimensions to re-cast obdurate or complex problems in terms of prior experiences to which existing solutions apply. This fluid, discursive process of comparison is a species of commensuration. Commensuration, 'the comparison of different entities according to a common metric' (Espeland & Stevens, 1998: 313), has much in common with Callon's conception of framing. It also relates to the emphasis on translation that is common to both actor-network theory (Latour, 1999)

and narrative management theory (Czarniawska-Joerges, 1997). More importantly, joint processes of docket definition and deal-making in the TLO effectively create a multi-dimensional space in which commensuration can occur. Locally appropriate comparisons across disparate technologies and deals generate and sustain a set of metrics that ease future commensuration work.

Specific comparisons are sometimes institutionalized as rules of thumb, canonical stories, or pieces of standard, 'boilerplate' contractual language. Such concretized comparisons rationalize technology associates' experience, dim alternatives and shroud the contingent origins of new rules, contracts, or procedures. Rationalization occurs through organizational learning and streamlines future work in the TLO while progressively constraining it. The abstraction of general rules from particular comparisons depends intimately on the process by which technologies are defined and deals are framed. Definitions and framing catalyze problem cases whose history-dependent resolutions drive learning. Docket-description, deal-making, and problem-resolution efforts in the TLO highlight productive linkages between economic sociology, science studies, and organizational theory, while providing new insight into the micro-level sources of institutional transformation.

In what follows I introduce the TLO, its inhabitants, and the meetings that make up my primary data source. I then consider a central activity in TLO gatherings: the presentation and description of inventions. Such presentations highlight the heterogeneous character of technology dockets while defining the dimensions that licensing associates use to make decisions and draw comparisons. The next section focuses on the comparisons themselves through the lens of commensuration. TLO comparisons highlight the fluid, contingent nature of contrasts that rely primarily on local experience.

Successful resolutions of sagas forge fleeting connections across disparate technologies, deals, markets, inventors, and policies. When the outcomes of particular discussions are concretized through organizational learning, they rationalize the experience of technology licensing officers and fix local and transitory commensuration processes into stable, easily transferable rules, routines, and standards.² The gradual accretion of such tools masks the situated nature of TLO discussion and generates a stable set of pathways and arrangements that constrain the range of possible routes by which new innovations can legitimately exit the university.

Data, Method, and Setting: Introducing the Technology Licensing Office

The TLO at the EPU is one of the older and more successful of its kind. It was founded many years ago, has an enviable record of economic success, and enjoys a positive reputation among faculty and administrators. Over the course of its existence, the TLO has processed several thousand invention disclosures, prosecuted hundreds of patents, and generated tens

of millions of US dollars in revenue from licensing deals that transfer rights to EPU technologies to other organizations and individuals. More than 20 professional and administrative staff members occupy the better part of a floor in a well-appointed medical office building on the outskirts of the EPU campus where they evaluate, negotiate, and manage dockets and deals.

The TLO's licensing associates are overwhelmingly young and female. At the beginning of my fieldwork in late 1999, all but four associates in the office were women and the average employee was in her early thirties. Few licensing officers boasted the formal education or certification credentials characterized in a standard sociological definition of a professional. One had received the PhD in a life science field and several others, including the director, held graduate degrees in engineering or management; however, most TLO staff members had a bachelor's degree in a technical field and received the bulk of their training on the job. There were no attorneys among the TLO staff. The absence of lawyers is a matter of long-standing hiring policy, which emphasizes business and marketing skills and a relational rather than contractual focus on deal-making and deal-maintenance.

When faculty (or, increasingly, student) researchers at EPU believe they have invented a potentially valuable technology, they disclose their innovation to the TLO. Invention disclosures open dockets that are assigned to associates.³ Individual associates have 'cradle to grave' authority over their technologies. Long-time staff members often cultivate lasting relationships with inventors and licensees. Associates mine these relationships for information that aids them in evaluating the technical and market potential of disclosures. Those evaluations culminate in decisions about whether to pursue intellectual property (IP) that are often coterminous with efforts to develop marketing strategies and negotiate licensing deals. Associates are also responsible for managing and updating their dockets as new disclosures and deals are added to the mix. Despite their autonomy, licensing professionals rarely make decisions in a vacuum. The TLO staff meets often to discuss new dockets, deals, and the problems that can arise from them. Outside of office meetings, the primary means of formal oversight is the simple requirement that Susan, the TLO's longtime director, sign off on all deals concluded by associates.

Several types of meetings provide opportunities for collective discussion and informal control. These conversations are also occasions for new staff members to learn the tricks of the trade. To this end, the TLO is divided into functional groups, called the 'Bioteam' and the 'Physci' (pronounced 'fi-sci') team. Teams meet weekly. The former concentrates on biomedical innovations, while the latter emphasizes physical science and engineering technologies. Associates commonly noted the lack of an established training curriculum for academic technology transfer professionals. As Larry, an experienced associate, noted, 'There is no curriculum for training someone. We try to send people to the AUTM [Association of University Technology Managers] meetings, but they are really

going to learn more by being here on the job.’ Another associate, Jennifer, was more succinct: ‘You should come to Bioteam. Those meetings are where we learn.’ The separation into teams is more symbolic than actual, however, as several experienced staff members and Susan ‘go both ways’ by handling life and physical science dockets.

The entire TLO staff also gathers monthly for a review of open dockets and active deals. The ‘monthly meeting’ is characterized by rapid-fire descriptions of new disclosures and reviews of ongoing negotiations. Associates make a game of these meetings by attempting to complete their reviews in less than the hour allotted. When they are on track to an early finish, discussions devolve to a cryptic shorthand with descriptions stripped to a bare minimum identified by docket number, the name of an inventor or licensee, or – in the case of particularly active, long-standing, or troublesome cases – a nickname. In contrast, the more numerous and substantively focused team meetings are longer and feature more elaborated discussions.

Monthly and team meetings provide insight into licensing associates’ perceptions of the office’s diverse case-load while foregrounding the collective processes that render problems sensible and resolvable. I attended 38 such meetings over the course of my fieldwork with the TLO. During meetings, I focused on capturing (in field notes) the reports and discussions that are the centerpiece of these gatherings. I kept participation to an absolute minimum in order to facilitate my open taking of detailed notes. I elaborated my notes as soon as possible after leaving the field and routinely checked my representations and interpretations of meeting discussions with interlocutors in the TLO.

Meeting notes are supplemented with other observations, interviews with TLO staff, faculty, and university administrators, and with archival data collected from EPU and other sources. The notes were domain coded to capture instances in which associates described new or established dockets, made explicit comparisons across dockets or deals, and reported on sagas. These data are the empirical basis for the analyses presented here. Unless otherwise noted, field note excerpts reflect participants’ discussions with each other rather than accounts offered to me.

Assembling and Describing Technologies

Dockets are Assembled from Heterogeneous Components

The terms ‘technology’ and ‘docket’ are often elided in TLO discussion. Potential licensees browsing EPU technologies online can follow a hyperlink labeled ‘Tech search’ from the TLO homepage to a ‘Docket Search Page’. Within the office, dockets are the relevant category for discussions of both technologies and deals. Dockets are conceptual and actual catch-alls that contain invention disclosures, information on intellectual property, inventors, potential markets and licensees, and often the professional hunches of associates.⁴ In the parlance of the TLO, dockets reflect much

more than the technical characteristics of an invention or the bundle of legal rights conveyed by a patent. Leanne, a relatively new associate, emphasizes this separation in a Bioteam report on an ongoing negotiation for a docket that includes three patents: ‘All the claims this licensee needs are part of the same patent, so I’m not sure if we should license the docket or just a patent.’

Dockets also bundle inventors, deals, and licensees. They are assembled and maintained by work done in the office and sometimes pull disparate inventions together on the assumption that they will be easier to market as a package. Such a dynamic is evident in the following monthly meeting discussion where Lisa presents a new disclosure that reports a method to minimize a commonly used research device.

Lisa: Doug is looking at different ways to miniaturize this instrument. I think it could be good for all kinds of measurement devices. He thinks it might also be useful in the biotech space, but I am not sure how so I am going to market it as an entrepreneurial opportunity.

Larry: Remember that we have never figured out what to do with that [similar device]-on-a-chip thingy from Louie.

Lisa [making a note]: So maybe we bundle them and try to license them together as a package?

This short discussion implies many features of dockets. Rather than representing a ‘naked’ technology, Lisa’s brief report – recall that monthly meetings rarely feature expansive discussions – encompasses potential uses, the preferences, suggestions, and identity of inventors, and traces of her own strategizing. When Larry notes a technical similarity between her disclosure and another docket that carries its own technical-inventor-market constellation, the picture becomes more complex. Here, two associates emphasize some of the socio-technical components that comprise dockets while working to actively bundle disparate technologies for market.

Such construction efforts suggest that dockets are malleable. The TLO staff does exercise a degree of explicit control over the shape dockets eventually take and the uses to which they are put. Nevertheless, it is common for associates to report upon obdurate or problematic aspects of docket assemblages that require ‘management’. Individual components of dockets are rarely separable from the whole. Hence problematic features can become a running source of frustration for associates, as evidenced by Molly’s comment during a team meeting about a troublesome inventor: ‘He is the problem, the damned inventor. Someone needs to tell him that this is not his technology, that he does not own it and that he has no say in what we do with it.’ Managing inventors – who often play essential roles in developing and marketing dockets – is a tricky business for an office whose organizational mandate is framed in terms of service and whose average staff member is a relatively low-status player on an elite university campus. While technical descriptions tend to obscure inventors, docket portrayals

emphasize inventor knowledge, personality, and history as important components of a technology.

The variously ‘social’ components of docket components are so salient in the TLO that new staff members are commonly guided through non-technical descriptions of the innovations they handle. Consider the following excerpt where Tom, a newcomer, describes his decision to ‘table’ an invention disclosure.

Susan: Tom, I’m interested in Mobile Architecture. What is that?

Tom: It is a new kind of interface that lets people direct all of their communication streams to a chosen location. It is completely scaleable and looks kind of neat.

Larry: So who did this?

Tom: It was Bob Jones in [an engineering department].

Susan: If it was neat, why did you table it?

Tom: It is listed as tabled because it was going to be dropped. I thought it looked cool so I set up a meeting with the inventor. Bob has set up a sort of beta-test in his department.

Lisa: Is there IP?

Tom: Yes, there are some copyrights but the patent dates were missed.

Lisa: But he has an actual prototype? Cool.

In this passage Susan’s innocent question, ‘What is that?’ evokes a purely technical response. That characterization alone appears to be insufficient as three senior staff members prompt Tom to describe four additional docket components: the identity and location of the inventor; the extent of IP protection; the logic behind his decision; and the presence of a working prototype. Conversations like this one illustrate associates’ conceptualization of docket components as socio-technical assemblages, while emphasizing the subtle training role that meeting discussions play.

The Demography of Docket Components

Elaborated meeting notes captured 157 distinct descriptions of individual docket components. For the purposes of coding, such portrayals are characterizations of new and active docket components offered by associates to their colleagues in meetings. Open coding of these descriptions yielded a set of 15 distinct socio-technical components that were included in at least one depiction. Table 1 presents those components along with a brief definition and their absolute and relative frequency of appearance.

Note the wide range of things that are made explicit in docket descriptions. More than 60% of meeting reports elaborated on the technical features of inventions, leaving nearly 40% of descriptions that make no

TABLE 1
 Definition and frequency of appearance of assemblage components in observed docket descriptions, 1999–2001

Assemblage component	Docket description emphasizes . . .	Frequency (N)	% of Descriptions
Technology	Technical characteristics of an invention: mechanisms, functioning, scientific underpinnings, and so on	101	64.3
Inventor	The personal, professional, or social characteristics of inventors	94	59.9
Licensee	The nature, needs, and preferences of potential/actual licensees	66	42.0
Intellectual Property	The nature and features of intellectual property rights (for example, patents, copyrights, trademarks) to a technology	61	38.9
Market	General estimations of the size and type of market potential	44	28.0
Deal	Legal/contractual aspects of a specific licensing deal (for example, royalty rates, milestones, equity payments and so on)	27	17.2
Funding	Sources of R&D funding underlying the technology's development	9	5.7
Publication	Venue, timing, and/or reception of an academic publication reporting on the technology	7	4.5
Expert	Expert evaluation of the technical, legal, or business prospects of a technology	7	4.5
Policy	Specific university policies relating to the docket	6	3.8
Costs	TLO expenditures on intellectual property associated with the docket	3	1.9
Associate	The identity or prior decisions of the associate responsible for the docket	3	1.9
Birdseed	Use of TLO grant funds to support prototype development	2	1.3
Public Relations	Public and/or media perceptions of a docket or deal	2	1.3
Risk	Estimations of potential legal liabilities to the university	1	0.6

N = 157 docket descriptions

Notes: R&D, research and development; TLO, technology licensing office.

explicit mention of a docket's technological characteristics or purpose.⁵ It is clearly possible for TLO officers to signal important things about a docket absent consideration of the technology it represents.

Two other common dimensions – inventor and licensee – carry importance though implicit signals about technical characteristics. Consider the following examples, which both emphasize non-technical docket components.

Example 1

Leanne: On to Jane Doe's docket. [American Pharma] wants to take a license because they like Jane, but they didn't even look at the patent.

Example 2

Jennifer [looking down at the docket list in front of her]: I don't even know what this one is.

Sara: Well, just look at the inventor list

Jennifer: Oh, yeah, this is the one with that [Tech Co.] inventor. They are collaborating on this, but we are getting the assignment.

These two examples rely on the identity of the inventor and, in example 1, the licensee to convey information about the docket. This replacement effect is most obvious in example 2 where one of the office's technically trained associates is confronted with a docket whose technical features she cannot quickly parse. In lieu of technical detail, the inventor list provides the signal she needs to characterize the new disclosure.

When read in light of Table 1, these examples also illuminate the multiplex character of dockets. Most docket portrayals highlight multiple socio-technical threads. Consider examples 1 and 2 given earlier. The former references the inventor, licensee, their relationship, and relevant IP. The latter focuses on inventorship, collaborative work (an EPU project conducted jointly with engineers from a local firm), the patent, and the specifics of its ownership in a potentially ambiguous situation.⁶ Such multi-component descriptions come closest to the sense of a network or assemblage offered by the actor-network theory. Most TLO dockets are constituted by multiple strands of disparate information.

Less than 11% of docket descriptions are unitary, while nearly half (49.7%) emphasize three or more of the dimensions listed in Table 1. Most single component cases include purely technical characterizations of fairly 'simple' technologies as in Sally's curt presentation of one of her dockets: 'This next invention is just a thing that measures cervical dilation during labor.'⁷ Contrast this very simple description with another brief, though extremely dense, characterization that references no less than seven of the docket components highlighted in Table 1.

Leanne: [Docket name] is a [compound] from Harold's lab that is supposed to be good for [ailment 1] and [ailment 2]. He knows folks at

Mid-Sized Pharma, but we are not going to shop it until the paper comes out. He is revising that for publication in *Science*. So we are doing an option with Mid-Sized Pharma, who is also going to be doing a ton of sponsored research in Harold's lab. We are waiting for conflict on that one.

This excerpt provides a clear sense of the expansiveness with which associates view the 'contents' of docket. This example encompasses: (1) technical dimensions, (2) the inventor and his relationship to (3) a potential licensee whose (4) deal – an option to take a license after the (5) scientific publication has been used to broadly 'shop' the docket – may or may not include (6) significant sponsored project funding that triggers (7) the invocation of a specific EPU conflict-of-interest policy on whose outcome this particular socio-technical constellation depends – 'We are waiting for conflict on that one.'

The final, policy-oriented, feature of this excerpt evokes another long-standing analytic emphasis of actor-network theory: the link between the stability and mobility of socio-technical arrays (Latour, 1987). In this case, a potentially unstable policy component may alter the composition of the docket (by removing the licensee, deal, and potential funding) and thus prevent its transfer via this market channel. Note, however, that the publication accomplishes another, more traditional, form of information transfer. Dockets and the technologies that they encompass can be conceptualized as socio-technical constellations. Once constructed, their stability depends on associates' management of problematic components. Such efforts are another key focus of TLO work and conversation.

Decisions and Problems: Stabilizing and Framing Dockets for Market

Dockets are shaped by explicit decisions and by ongoing case management efforts in the TLO. Both dynamics are apparent in the decisions associates make about new disclosures. Consider the question of whether to pursue intellectual property protection for a new invention. Patents legally demarcate the 'metes and bounds' of an inventor (or assignee's) property while conveying monopoly control for a period of 20 years. Hence patents are exceptionally important components of docket and are mentioned in more than 40% of docket depictions.

Decisions occasionally hinge on expert legal evaluations of patentability, as in Christine's description of a 'dropped' docket: 'We are just going to drop this. It is not separable from the prior art. We had [an IP law firm] do a patentability assessment and their report came back non-separable.' Such cases are exceptional, however, as patenting decisions more often draw on a technology's distinctive confluence of docket components.

Consider an extended Bioteam discussion of a patenting situation that results in a decision to file.

Jane: I have that Rich Smith therapeutic. He just got a [federal grant] to cover development to Phase 1 [clinical trials]. The original patent has been on appeal for 3 years, but the data he put in the grant suggests that this works. He thinks it is going to be efficacious in humans and wants to file a CIP.⁸ How do you all feel? We've already spent [US]\$30,000 on this docket.

Sally: File a provisional and convert it to a CIP if you need to.

Susan: Why is there such urgency?

Jane: He publicly disclosed his data at a conference 8 months ago.

Susan: Ahhh

Jennifer: Besides this filing what we have is one patent on appeal that we can't find a licensee for. Why do we feel so good about this technology?

Leanne: Wait. Have we already marketed this thing?

Jane: There was no real interest.

Sally: So re-shop it with his new data and file the provisional if someone bites.

Susan: Was this the docket that [Pharma Co.] expressed an interest in?

Jane: They were interested.

Susan: What made them skittish?

Jane: There was a vague reference in an old paper that suggested this could be done. They decided it was obvious. No one on our side agrees but [expressive shrug].

Susan: Just go for it. The grant is peer-reviewed and their focus is more applied than an NIH [National Institutes of Health] section. He has been a good inventor for us. Besides if it shows efficacy in clinicals, then we will be really glad we did this.

In this case an established inventor requests that the TLO file a new patent application, the CIP, for a therapeutic compound they had been unable to successfully patent or license in the past. The inventor's confidence rests on his successful application for a grant that will fund development work and pre-clinical testing, but the decision must be made quickly as a conference presentation publicly disclosed the new data. The discussion begins with a docket description that emphasizes inventor characteristics, technology, IP, funding, and costs, and ends with a question about whether to pursue further patent protection in light of these factors. The subsequent conversation emphasizes more docket characteristics as suggestions are made and skepticism offered. Licensee characteristics and responses to marketing efforts are discussed along with a more detailed consideration of potential IP difficulties before a decision is made.

In total, nine⁹ of the 15 components highlighted in Table 1 are mobilized in this collective decision-making effort. Susan's final judgment emphasizes three dimensions, drawing on: (1) the expert evaluation offered by peer review; (2) the inventor's track record with the office; and (3) the potential market value of a Food and Drug Administration (FDA) approved drug. This field note excerpt suggests that diverse features of dockets are used both for descriptive and decision-making purposes.

Multiple docket features are also actively considered in decisions about how and to whom to license. Information gleaned from broad marketing efforts, 'shopping', and from more specific evaluations by potential licensees plays an important role in docket construction. In the excerpt earlier, the decision about whether to add a patent to a docket hinges, in part, upon levels of corporate interest in a prior patent application covering the same technology. The interleaved character of assembly and marketing efforts highlights two features of dockets that make their transfer through market mechanisms problematic: (1) dockets are only as stable as their least stable components (Latour, 1999: 151–53; Law, 2003); (2) successful marketing requires that heterogeneously assembled technologies be framed as discrete and separable entities (Callon, 1999).¹⁰

Latour and Law remind us of the effort required to enroll diverse actors into a coherent and stable fact or artifact. Like dockets in the TLO, 'an object is an effect of an array of relations, the effect, in short, of a network [I]t holds together, it is an object, while those relations hold together and don't change their shape' (Law, 2003: 1). Callon (1999: 188) agrees, but contends that the sale of such an object requires that those very connections be obscured:

Framing is an operation used to define individual agents, which are clearly distinct and dissociated from one another. It also allows for the definition of objects, goods, and merchandise, which are perfectly identifiable and can be separated not only from other goods but also from the actors involved, for example, in their conception, production, circulation, or use.

The TLO's efforts to describe and evaluate dockets while shopping them and negotiating deals are at odds. The conflicts inherent in contiguous efforts to assemble, evaluate, and frame new technologies routinely create problem cases that require resolution. Most problems arise when technologies that have been framed for market overflow the boundaries that associates draw around them. Overflowing occurs when one or more constitutive components of dockets destabilize. When one of the dimensions of an array becomes problematic, the relatively clean, transferable entity created by office framing efforts becomes entangled and further work is required to repair, or manage, the docket's unruly features.

Thus, TLO discussions swerve from portrayals of dockets to discussions about sources of instability that raise licensing difficulties. Consider this passage, which emphasizes the important role inventors play in 'holding deals together'.

Susan: Does Fred [an inventor] have the wherewithal to hold this thing together? The agreement is a snap, but managing it after the fact is going to be a real problem.

Leanne: Well Al [Fred's sometime collaborator] has a firmer and lighter hand than Fred does.

Susan: Pump Fred up. Tell him he has to be strong.

Lisa: If we can just keep [the licensee] under control, then this whole thing will work out fine.

This interchange suggests concern with potential sources of instability in deals (the managerial competencies of an inventor and the actions of a licensee) and the sense that associates should manage such difficulties. The range of challenges that emerge in TLO work is most apparent in a specific type of deal: limited exclusive licenses to particular fields of use.

Framing and Overflowing in Field-of-Use (FOU) Deals

The ultimate cause of many TLO sagas is its location in a highly visible academic institution. The office's mandate is to license technologies broadly and lucratively with an eye toward the public good and the development of research capacity through the re-investment of revenues. This mix of missions implies contradictions that center on licensing decisions. Broadly speaking, a 'license' is a contract that transfers rights to make or use a patented invention to an entity other than the patent owner. There are two broad classes of licenses. Exclusive licenses transfer rights to use a technology and to exclude others from its use. In contrast, non-exclusive licenses transfer the right to use a technology but not the right to prevent others from using it.

Non-exclusive licenses to widely used processes or tools (for instance Columbia University's licenses for the 'Axel' patent on a biotechnology process called co-transformation) can be extremely lucrative. 'Non-ex' licenses sometimes match breadth with lucre. Nevertheless, significant royalties, equity stakes in new firms, and large licensing fees are more often associated with deals that grant exclusivity. Corporations seeking to attract venture capital and those facing regulatory hurdles – such as the FDA approval process – often require long-term exclusivity. These fiscal and strategic factors push a business-oriented office toward exclusive licensing at the potential expense of ensuring broad access to university technologies.

This TLO manages the dual institutional pressures to license broadly and lucratively by emphasizing a particular type of license that limits exclusivity to a particular technological area. FOU licenses walk a middle ground between broad and exclusive licensing regimes by partitioning a technology into separable technical 'fields' and offering exclusive rights to those areas individually. Another common form of limited exclusivity specifies a license term significantly shorter than the life of a patent. FOU

and time-limited deals allow the office to license both broadly *and* exclusively by offering multiple firms sole rights to different uses of the same technology. Contractual definitions of non-overlapping technical fields of use for early stage technologies exemplify the framing process described by Callon (1999). Their widespread use is the proximate cause of many TLO sagas. Susan's comments in an interview emphasize the benefits of FOU's and the dangers of imperfect framings:

Almost everything we do is field-of-use. The positive side of that is that you can get more than one license in different fields. But there is also a negative side. If there is a problem with a patent or a relationship, then you have compounded your difficulties if you have licensed it to multiple entities.

When an institutional emphasis on breadth increases reliance on FOU's, technologies that overflow their frames entangle multiple deals and licensees. Thus efforts to partition dockets into multiple fields raise more comprehensive management challenges for associates than commonly result from either fully exclusive or non-exclusive arrangements.

University licenses often convey rights to early stage inventions that require further development. The office's informal emphasis on maintaining long-term relationships with licensees and the importance of inventors' tacit knowledge to development efforts link many dockets to ongoing collaborative research efforts. Consider the following discussion of a license that involves continued research and hence the transfer of proprietary materials from a corporate licensee to a faculty laboratory.

Susan [shaking her head]: Two years from now we are going to be sitting around this table wondering why we agreed to this.

Gloria: The major issue is that they want access to Paul's technology, but they are pushing us to agree not to do any 'commercial' research under the deal. That is really cutting into the holy clause.¹¹ We just added a line to the deal that says we are a university, *of course* we do not do commercial research. I am hoping that takes care of that.

In this case a deal includes a licensee's attempt to restrict research conducted by a faculty member. This source of potential entanglements is met with a proactive attempt at management. In a clear example of boundary work (Gieryn, 1999; Guston, 1999; Lamont & Molnar, 2002), Gloria emphasizes (with some irony) that academic institutions do not do commercial research and thus cannot face such restrictions.¹² This excerpt highlights TLO efforts to anticipate incipient difficulties, their proactive efforts to limit entanglements, and the Janus-faced role enforced by their academic status.

Further entanglements can emerge from sponsored projects that support ongoing research and sometimes carry options to IP rights for sponsors.¹³ Options offer 'rights of first refusal' to technologies, which result in 'encumbered' licenses where deals with other corporations must

be negotiated ‘but for’ existing contracts with sponsors. Pre-existing rights further confuse framing efforts, making negotiations more challenging and contributing to the birth of sagas.

Two discussion excerpts – one from a Physci meeting the other from the Bioteam – emphasize the ubiquity of FOU deals and the complex problems that limited exclusivities catalyze. In the following Physci excerpt, the group discusses problems arising from an FOU license granted to a local start-up company. The technology in question emerged from an ongoing project at the university, whose multiple corporate sponsors received options for non-exclusive licenses in return for their involvement. These options were intended to expire when the project ended but were unexpectedly extended when it received additional funding. Here pre-existing options, a changing business environment, and imperfectly framed field definitions require associates to collectively make sense of a challenging legal and technical situation.

Audre: [Startup Co.] wants to exercise its exclusive option, but that exclusivity is not worth much since multiple sponsors still hold options.

Lisa: The agreement says we can give licenses in some fields to one firm while giving non-ex access or exclusive access to other fields to another where it is ‘legally feasible’ to do so. Will it work if we give the imaging field to Startup Co and save the other areas for sponsors? Our start-up agreement says we have to give them imaging.

Susan: But we didn’t give it to them?

Lisa: Nope. What we have here is a case of ‘slightly’ conflicting agreements.

Susan: So who is in line for all the fields?

Lisa: [Sponsor 1] with [their spin-off] piggy-backed.

Audre: [Sponsor 2] is in line too, but they are holding off.

Lisa: Should we try to renegotiate with Sponsor 1?

Jim: I’m trying to figure that out. Imaging is pretty broad, but Startup Co. only works in that area, right?

Lisa: They actually work in sensing, but that is a subset of imaging. We have two conflicting agreements, which one wins?

Susan: Go back to Sponsor 1 and renegotiate.

Larry: We only did the all field options for Sponsor 1 and Sponsor 2?

Audre: Yes. But now that the spin-off is piggy-backed do we need to renegotiate them independently?

Lisa: That is tough. They got in on this under the agreement’s affiliate language.

Susan: But they aren't an affiliate any longer.

Lisa [flipping through a document]: That's true, the language only covers 50% ownership or negotiated exceptions.

Susan: We made sure Start-up Co. knew this was a possibility when we signed the deal. Can we just give them exclusivity but for existing agreements?

Molly: That does not offer much clarity.

Susan: It looks like we are just going to have to feel our way through this one.

Several interesting features stand out in this discussion. The primary entanglements noted here – conflicting agreements and the difficulties raised by the 'piggy-backed' spin-off – arise from changes in commonly discussed docket dimensions. First, a funding extension prolonged options that were expected to expire, generating conflicts between those deals and the 'start-up agreement' that promised exclusive rights to a particular field of use to Startup Co. Second, alterations to a licensee – Sponsor 1's decision to spin-off a new company – resulted in an importantly changed strategic environment for Startup Co. Where neither sponsor competes directly with Startup Co., the spin-off pursues a similar market using an overlapping technology. Their 'piggy-backed' non-exclusive access to Startup Co.'s central technology could be devastating.

These two instances of mutability helped to create the case of 'slightly' conflicting agreements that is the focus of this collective effort at defining and resolving a problem. Conversations that 'feel their way' through problem cases are exploratory in character (as evidenced by repeated questions about the problematic characteristics of this docket) and often feature multiple suggestions for resolving a particular problem.

These discussions enable the office to draw on associates' collective experience and thus they sometimes generate straightforward resolutions for sagas. In the following excerpt, Leanne, a relatively new Bioteam associate, casts about for a solution to another problem involving FOU deals and Molly, a much more experienced associate, offers a workable solution to her problem.

Leanne: I am trying to work out whether the FOUs we negotiated on [Protein technology] will overlap. We have negotiated an FOU for [X-use] with Bioneuvo. The non-ex for [Y-use] went to Xigene, and then there was an exclusive for [Z-use] to Genlight. That is the complicated one because it excludes X and Y but includes [two other fields]. That deal is *really* long and complicated. It gets even worse because every time I get a new request for a license I have to go look at the Genlight deal to see what we can do.

There are even some big companies interested. Nutra-co wants to license it for tests in a manufacturing facility. But that use is partially covered by both Xigene and Genlight. Xigene does not matter but Genlight's exclusive could be a problem. Dairy-co wants a license for a

similar internal use. I'm trying to figure out how to define new FOU's so that we can license the thing as broadly as possible. The problem here is not in the technology. It is in our ambiguous language. This is a problem we have talked about before. When we did this deal Jennifer told us the field was too broad, but we decided to go ahead even though we knew that we would have to get any new licensees to buy in but for Genlight. Now Genlight is back and they want to extend their licenses and clarify their field.

Molly: Just offer them a trade. Tell them that you will let them extend and clarify without the usual fee if they will allow you to do two new non-ex licenses in their field.

[Two months later, Leanne offered the following update to the Bioteam]

Leanne: On that protein technology license to Genlight, we are broadening their exclusive FOU and in return they are letting us do two new non-ex licenses. So Genlight now has all of the [Z related] areas except for [X], which we originally carved out for Bioneuvo.

Again, a technology that overflows the partitions that multiple FOU deals place around it raises problems. Cleanly bounded FOU's are challenged as numerous companies express interest in different aspects of a technology that is used to identify the presence of specific proteins in solutions. The situation is exacerbated by pressures from a licensee (Genlight) to broaden its term and breadth of exclusivity, and by a set of new overlapping deals that may become the wellsprings of future sagas. The problem at issue grew from the interstices of several TLO characteristics. A lack of legal or technical training may have contributed to conflicts in deals and FOU's. Similarly, deep concern with the mandate to license widely drove Leanne's desire to accommodate all potential licensees in the face of an early contract that the office recognized as overly broad.

The solution Molly proffers and Leanne implements is, predictably, less legal or technological than relational. Rather than revising contractual language or seeking a technical way out of the difficulties raised by overlapping fields, associates trained in and experienced with the TLO's relational focus pursue a trade with a long-time licensee. Here, a relative novice's presentation of a complex problem evokes a simple and locally appropriate solution from a more experienced colleague. In this case, experience transfers easily in a meeting as Molly helps to resolve a clearly defined problem. More often than not, though, easy resolutions are unavailable and meetings become a location where new problems are re-defined in terms of older situations. Commensuration, the act of comparing different entities along a common metric, is central to such efforts.

Commensuration and Problem Resolution

Commensuration's market-making characteristics center on the actual processes by which incommensurable entities are transformed into a common metric that enables their comparison and transfer. Levin & Espeland (2002: 135) highlight the features of commensuration that are most central to understanding work in the TLO.

Commensuration initiates transformations of all sorts. It turns qualities into quantities, heterogeneous goods into homogeneous ones, messy complexity into straightforward hierarchy. A key mechanism in the structuring of markets, it helps change intangible things into commodities.

In the TLO, commensuration work occurs in meetings where comparisons reconfigure new and unfamiliar problems in terms of established solutions to existing challenges. Thus, commensuration is central to the process TLO associates use to resolve sagas generated when messy, heterogeneously assembled dockets overflow the frames that enable their transfer to market.

Analyses of TLO discussions also contribute to theories of commensuration. Much commensuration occurs through the development of a single 'objective' metric that allows easy comparison of varied entities. Consider, for instance, futures prices that enable ready trading in commodities as varied as pork bellies, crude oil, pollution, and gold. The salient role that multiple docket dimensions play in office decisions suggests that any given docket carries multiple competing metrics for comparison. The challenge, then, is to determine which possible comparison fits. TLO comparisons center on objects that are locally and collectively assembled. TLO associates are highly experienced with local presentation and discussion styles, but generally lack professional training in legal or technical fields. In short, the 'correct' metric for any given comparison the office undertakes is neither given in the order of the things being compared, nor encoded in normative standards of professional conduct.

Instead, I contend, active dimensions for comparison emerge from discussions of dockets. When faced with novel situations, associates draw on commonly invoked docket features to search for an appropriate metric. The variety of possible dimensions enables workable and appropriate comparisons at the expense of significant differences between cases. Thus successful commensuration on any given dimension necessarily represents simplification and translation across complex situations. Consider the following example where recognition of a shared faculty advisor results in a similar licensing deal. E-co and F-co are two start-ups founded by students from a research group run by Dalton, a senior faculty member and prolific inventor. Both companies depend on (different) inventions developed in Dalton's laboratory and he is an inventor on both patents. In this excerpt, Larry expresses concerns based on Dalton's involvement with the companies.

Larry: Here is another Dalton student wanting to start a company. I remember how difficult he was when we licensed E-co. So I am planning to use that model for this new company. F-co is a good bet, [the student founder] put together a good business team. He proposed an exclusive deal for one FOU and a non-ex for the other areas. It looks a whole lot like the deal we did with E-co, which was also exclusive for one field and non-ex for the others. This technology has some pretty important applications. So I think F-co should be a three-year deal. The problem is that E-co

wants to extend their old license and I'm afraid that if we give them two more years Dalton will push for a full five years up front for F-co. I do not want to do that because the potential for this docket is too big. Now if F-co comes back in three years and says 'We want a couple more,' then ...

Susan: We'll do exactly what we did with E-co. We will shop it and if no one else wants it, then we will extend.

Larry: Is it justifiable to give F-co the same terms as E-co even though they are cheap by today's standards and this is a larger field?

In this case an experienced associate tries to head off potential difficulties by appealing to a key similarity between this case and an older deal: E-co and F-co founders share an academic advisor and co-inventor who has raised difficulties for the office before. Despite important and explicitly noted disparities in market potential and implied differences between business teams, the same advisor and similarly structured proposals lead Larry to suggest a shorter-term license than he might otherwise consider. His final question emphasizes both the similarities that contributed to his decision and the differences that, though manifest, were less active.¹⁴

Content coding of field notes yielded 74 comparisons like those presented earlier. Table 2 lists the 11 dimensions associates used to make those comparisons. The most notable feature of Table 2 is its remarkable similarity to Table 1. With the exception of one dimension (similar problems) all of the explicit comparisons that I observed referenced common components of docket descriptions. Figure 1 presents a histogram comparing the relative frequency of appearance of the six most common components of docket descriptions and commensuration cases.

Descriptions and comparisons share nearly identical characteristics, but their relative weightings vary with the use to which they are put. Where technological features dominate docket descriptions, deal characteristics are the most commonly used commensuration metric. In other words, commonly referenced docket components provide sets of metrics for commensuration without entailing a particular order for their use. The heterogeneously assembled character of TLO dockets creates a multi-dimensional space in which commensuration can be accomplished. Comparisons drawn along these dimensions connect new challenges to past sagas and thus shape office responses to novel situations.

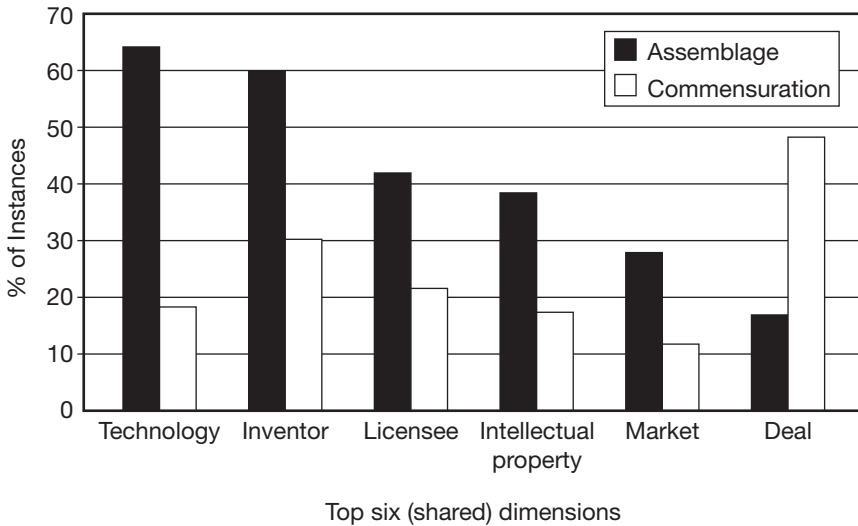
While multiple metrics for comparison can act simultaneously, most commensuration efforts emphasize fewer dimensions than do docket descriptions. More than 47% of comparisons draw on only one of the metrics highlighted in Table 2. None simultaneously references more than three docket components. Commensuration is overwhelmingly serial. Associates skip fluidly from metric to metric and from comparison to comparison in an effort to find a dimension and a benchmark that fit their situation and suggest possible resolutions. Under this model, organizational decisions proceed not by the random mating of problems and solutions suggested by a 'garbage can' model (Cohen et al., 1972) but by means of comparison metrics that are actively deployed in an unstructured but constrained

TABLE 2
Dimensions of comparison, definitions and frequency, 1999-2001

Dimension for comparison	Commensuration metric emphasizes	Appearances (<i>N</i>)	% of Instances
Deal	Legal/contractual aspects of a specific licensing deal (for example, royalty rates, milestones, equity payments, and so on)	36	48.6
Inventor	The personal, professional, or social characteristics of inventors	22	29.7
Licensee	The nature, needs, and preferences of potential/actual licensees	16	21.6
Technology	Technical characteristics of an invention: mechanisms, functioning, scientific underpinnings, and so on	14	18.9
Intellectual Property	The nature and features of intellectual property rights to a technology	13	17.6
Market	General estimations of the size and type of market potential of a technology	8	10.8
Associate	The identity or prior decisions of the associate responsible for a docket	4	5.4
Policy	Specific university policies related to the docket	4	5.4
Problem	Characteristics of the problem being discussed (for example, FOU entanglements, and so on)	4	5.4
Public Relations	Public or media perceptions of a docket or associated deal	4	5.4
Expert	Expert evaluation of the technical, legal, or business prospects for a technology	2	2.7
<i>N</i> = 74 explicit comparisons			

Note: FOU, fields of use.

FIGURE 1
Common dimensions apparent in docket descriptions and commensuration instances.



search for locally sensible connections between existing sets of problems and resolutions.

Commensuration efforts reach across gaps in relations among technologies, markets, teams, and time to connect disparate cases and link extant solutions to active problems. Such processes are akin to the ways in which organizations, such as the TLO, ‘learn’. Organizational learning refers to the instantiation of retrievable knowledge that is independent of individual organizational members in the rules, routines, standards, procedures, and stories of a collective (Levitt & March, 1988).

Contrasts sometimes result in the statement of general rules that can be easily mobilized at a later date without the need for active commensuration. Consider the following case where discussion of licensing strategies for a ‘nutriceutical’ docket prompts a comparison with another edible technology and a failed match leads to the statement of a general rule.

Christine: So basically what they want to do is put out a tastier version of a product that is already on the market.

Robert: Isn’t that what Ken was doing? We extended his license to the life of the patent.

Christine: We ended up licensing him for fifteen years, but they had all sorts of problems with formulation. They did not get a product out until this year.

Jim: It looks like if you are going to get a product on the market in less than a year, then you do not get an exclusive license for the life of the patent.

This short excerpt highlights the relationship between commensuration work and the abstraction of rules whose generality makes them transferable to a wide range of situations while obscuring the specific context and contingent efforts that are integral to their creation and local implementation.

Even more radical forms of abstraction are apparent when serial commensuration efforts – deployed across multiple metrics and comparison cases – result in organizational learning by means of new boilerplate language added to the TLO’s standard contractual tool-kit.

Larry: We are wrapping up a good deal on [L-tech]. We are getting a chunk of non-dilutable equity in Radcorp [a new start-up] and [US]\$100,000 up front.

Susan: Wow! What will this thing be in.

Larry: Well . . . everything. This is a chip that will let you do wireless communication anywhere. They are already talking with heavy hitter Vcs [Vice-Chairmen], so things are looking good there. But there is a problem [everyone groans]. George entered into a sponsored project with [Electronica] two years ago. That agreement had a clause that said if Electronica’s lab[oratorie]s were used exclusively for an invention they would get exclusive ownership of the technology. We signed off on that. Now, the student working on this project was actually an Electronic employee here on a sharing program. George advised him, but all the work was done in their labs. So the invention is based 100% on their equipment and they want exclusive ownership. The problem with that is that George is a co-inventor, so under our policy he has to assign to us. But wait, it gets messier. This deal is to a new start-up that wants a license and George has been consulting for them. So Electronica just went from total ownership, to partial ownership, to having a potential competitor that may license. I asked George if he was *really* an inventor and he said yes, but he is patent savvy. This is turning out to be a lot like that Jefferson case from a couple of years ago.

Lisa: So maybe some of the reduction to practice actually happened in a faculty office? Technically, faculty time is a university resource.

Larry: Whatever the outcome, it is going to be a mess. Electronica will be pissed.

Lisa: Isn’t George involved in a lot of *interesting* licenses?

Larry: Yep, he is a real gift meister . . . Hold it. Isn’t this deal a lot like that [Photocorp] case with the co-op? Is this sharing program like a co-op?

Susan: Maybe, but we should really think through this background rights issue. Lots of our problems involve background rights and they are getting more and more common in sponsored project agreements.

Larry: Our only problem here is whether we want to assert ownership or not.

Lisa: So none of this is going to land on us? This sounds a lot like that [Research Center] case. We only got off the hook on that one because they decided to dump their rights. What if [Compcor] or [Semco] hear about this and want the same kind of deal? Maybe we should send this to Frank and ask him to work up some boilerplate language.

Susan: Yes. This would be a good project for Frank.

In this discussion no less than four commensuration efforts are made as two experienced associates and the TLO director attempt to make sense of Larry's problem: (1) Larry's invocation of another 'patent savvy' inventor triggers Lisa's proposal of a new way to justify EPU ownership; (2) Larry's invocation of a similar deal is received ambivalently by Susan who (3) links the problem to other cases by citing a trend where similar 'background rights' in sponsored projects encumber licenses; finally, Lisa (4) invokes another corporation whose decision to drop their rights took the TLO 'off the hook' in a different deal. This comparison also raises the possibility that similar problems will recur, prompting a call for Frank (an attorney associated with the office) to draft new contractual language that can be mobilized at the outset of all future 'sharing' programs.

The generalization of a fluid, collectively negotiated, and context specific discussion to legally vetted contractual language represents another instance of organizational learning whose consequences become disengaged from the original connections drawn among cases, thus rationalizing the collective experience and future work of associates. Standard language reinforces a single dimension of comparison and veils rejected alternatives. Such learning streamlines and standardizes EPU's technology transfer process and represents a quantum of organizational change driven by the very work it shrouds.

Conceptual Spaces, Licensing Work, and Change in Universities

Three very different conceptual architectures structure TLO discussions. The heterogeneous assemblages that are a focus of much descriptive effort are comprised of arrays or networks in the sense proposed by the actor-network theory. Efforts to partition, or frame those networks into unitary and separable (hence transferable) commodities are exercises in the creation of bounded regions. Finally, freewheeling commensuration efforts are, metaphorically, fluid (cf. Mol & Law, 1994). Where regional spaces are defined by creating and policing boundaries, and network topologies emphasize heterogeneous but immutable arrays, fluids represent a world of mixtures and mobile continuity. Regions shift when their boundaries are violated and networks reconfigure when one or more of their dimensions vary. Fluids, however, draw continuity from their very instability.

The TLO – itself a social object that might be characterized in these terms – provides a strategic location to elaborate upon Mol & Law's (1994) social topologies, their inter-relationships and organizational implications. The difficulties inherent in transforming variegated docket assemblages

into contractually and technically definable regions are apparent in the framing and overflowing processes documented in this paper. Close consideration of TLO discussions, though, suggests that the strength and permeability of 'regional' boundaries are largely a function of internal stability in the very network configurations they tend to obscure. Instability in docket arrays, then, makes technologies difficult to transfer and highlights linkages across deals and dockets that are lost during framing. Similarly, fluid commensuration practices, which are characteristic of TLO meetings, occur in the multi-dimensional space defined by dockets. The components of docket arrays provide moderately stable channels for fluid translations across regions.

Organizational learning in the TLO offers an opportunity to examine how locally sensible connections drawn between conceptual spaces become institutionalized. TLO work has a dual character. Associates navigate easily across dockets and deals. But those maneuvers often generate sagas whose negotiated resolution sometimes results in the development of boilerplate language, rules of thumb, and standard operating procedures that rationalize future work by limiting possible comparisons. This dynamic combination of fluidity and concreteness offers new insights into the local-organizational basis of incremental institutional change.

Commensuration along multiple dimensions that cross contractually imposed boundaries enables situated work practices to create transient links among technologies, deals, licensees, inventors, and policies. These temporary configurations enable problem-solving by recasting obdurate sagas in terms of existing solutions. Organizational learning fixes some of these connections, obscuring their contingent underpinnings and reifying the particular metrics and characteristics that enabled a sensible 'fit' to occur in office discussions. When institutionalized through learning, stable rules, procedures, and language shape the conditions of possibility for subsequent dockets and deals, structure future work in the TLO, and contribute to the elaboration of university policies and professional practices for academic technology transfer.

Some of the EPU's responses to the transformations wrought by academic research commercialization are organic, driven by the situated work of TLO associates who struggle to direct their collective experience to resolve sagas under ambiguous institutional pressures. The stabilized and transportable outcomes of learning in this very visible TLO also contribute to the codification of professional practice for university technology managers more generally. TLO procedures and documents are often imitated. Associates routinely consult with other universities, offer didactic seminars and serve in administrative capacities in professional societies. The rationalization of experience that occurs when negotiated comparisons are fixed by learning also hints at the processes that transform local work practice and situated experience into codified professional expertise. TLO work, then, creates and sustains a set of conceptual spaces whose relationships and organizational embeddedness draw together central concerns in science studies, economic sociology, and organizational theory.

Notes

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1. In the interests of confidentiality, I refer to the TLO, the university it represents, and the organizations and individuals that work in or interact with it using pseudonyms. Similarly, some aspects of technology dockets and deals have been altered.
2. The close analogy that could be drawn between the rationalization of locally sensible practices and the black-boxing (Latour, 1987) of facts and artifacts is not lost on me. The connection between processes of organizational and institutional development and the construction of knowledge suggests fertile ground for the integration of economic sociology, organizational theory and science studies.
3. The decision to disclose is largely in the hands of faculty who, as a condition of EPU's intellectual property policy, have the right to place inventions into the public domain through publication. In practice, even this large and experienced TLO lacks the competencies and resources necessary to prospect for new inventions on campus, or to strongly police the efforts of faculty.
4. Older dockets that were opened before the office 'went electronic' are actual physical files that contain a sometimes astonishing array of material ranging from handwritten correspondence between inventors and associates to hastily clipped newspaper articles, correspondence with the patent and trademark office, grant applications and academic reprints. As physical artifacts, dockets are reminiscent of the 'author files' maintained by trade and academic publishers (Powell, 1985).
5. While some of these cases involve descriptions of well known technologies and thus are likely to assume a degree of background knowledge on the part of the audience, the bulk of docket portrayals come from monthly meeting discussions where associates introduce newly disclosed technologies to the office.
6. In cases where co-inventors work in separate organizations it is common for ownership, 'the assignment', of resulting patents to be held jointly by the organizations. In this case, however, full ownership went to the EPU because the corporate researchers were working as visiting scientists in a university laboratory.
7. The unitary nature of this very brief description does not imply that this docket is not also a heterogeneous assemblage in the sense used by science and technology studies theorists. Nevertheless, this excerpt suggests the power of technical descriptions of artifacts to 'black-box' and obscure the social features that underlie and enable their creation and use (Bijker & Law, 1992). More importantly for our purposes, simple examples such as this suggest that the range of docket features that are salient for TLO associates can be very limited. Whether this offers a gauge for the value that associates ascribe to a docket or simply an indicator of its relative ambiguity is unclear.
8. A CIP is a continuation in part, a means to file an application for a patent that is a substantive alteration of an existing application
9. Funding, Inventor, Technology, IP, Publication (public disclosure at a conference), Expert, Costs, Market, and Licensee.
10. For consideration of discussions and contracts in another TLO see Kaghan (2001) and Kaghan & Lounsbury (2004).
11. The 'holy clause' is included in every EPU license and is designed to maintain freedom of action for academic researchers by unconditionally reserving the right for EPU

faculty to practice licensed inventions. Corporate challenges to the holy clause can be enough to render a deal unpalatable to TLO associates.

12. This type of maneuvering may become more important in academic TLO as the widely shared assumption that academic inquiry falls under a 'research exemption' has met with setbacks in the wake of a recent decision by the Court of Appeals for the Federal Circuit (*Madey v. Duke*, 307 F.3d 1351; see also Eisenberg [2003], for commentary).
13. Such options are, at EPU, always for non-exclusive licenses as both university policy and TLO practice attempt to reduce conflicts of interest by forbidding deals that 'pipeline' IP rights from a university laboratory to a corporate sponsor.
14. It should be noted that one of the differences mentioned here is a cheaper than standard licensing fee. On at least one dimension, then, this act of commensuration benefited F-co.

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