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LOVE AND HATE IN UNIVERSITY TECHNOLOGY TRANSFER: EXAMINING FACULTY AND STAFF CONFLICTS AND ETHICAL ISSUES

Clovia Hamilton and David Schumann

ABSTRACT

With respect to university technology transfer, the purpose of this paper is to examine the literature focused on the relationship between university research faculty and technology transfer office staff. We attempt to provide greater understanding of how research faculty's personal values and research universities' organization values may differ and why. Faculty researchers and tech transfer office (TTO) staff are perceived to be virtuous agents. When both are meeting each other's needs, a "love" relationship exists. However, when these needs are not met, a "hate" relationship exists that is replete with doubt and uncertainty. This doubt and uncertainty creates tension and subsequent conflicts. There are many accounts where faculty researchers have not followed university policies and expectations, often violating policy and ethical standards. Likewise,

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faculty report numerous examples of how TTO staff members' negligence in servicing their attempts to be good institutional citizens have failed them. This paper explores this love/hate relationship and reveals numerous conflicts that call into question ethical concerns. It also provides a set of recommendations for reducing and potentially alleviating these concerns. Literature review. Results from a thorough review of the literature on the relationship between faculty and university TTOs reveals that perceived job insecurity is the primary reason that some research faculty members as well as some TTO staff, unethically violate their university policy to disclose invention disclosures and select to not provide full services, respectively. One way to alleviate the conflict between faculty's personal values regarding their inventions and university's organizational values is to enact measures that build trust and reduce insecurity among faculty members and TTO staff. In this paper, we not only examine this faculty/TTO staff ethical conflicts, but we offer a set of recommendations that we believe will reduce the likelihood of unethical behavior while encouraging greater institutional commitment and trust.

Keywords: University technology transfer; conflict resolution; ethical issues; scientific misconduct; personal values; organization values

INTRODUCTION

Virtuous agents are good role models with affective and cognitive sensitivity to the subtle differences in human association, and with the interplay of both reason and habit, are capable of appreciating and appropriately responding to the personal and interpersonal needs of others (Carr & Skinner, 2009). In general, virtuous agents in the academy are committed to their university community's moral sense of being; they are motivated to do good and they possess vision and discernment (Bersoff, 1996). In higher education, accomplishing alignment in mission that expresses the spirit of the community requires an individual's ethical good work to merge into a larger collective of ethical good work (Berg, Csikszentmihalyi, & Nakamura, 2003).

An important component of a successful research university is the ability to take basic research and find ways to contribute that research to the needs of the larger society. This is often done through the licensing and patenting of faculty "inventions." In America, inventions are "any art or

process (way of doing or making things), machine, manufacture, design, or composition of matter, or any new and useful improvement thereof, or any variety of plant, which is or may be patentable under the patent laws of the United States [35 U.S.C. §§ 1 et seq]" (USPTO, 2016). The research university uses its Technology Transfer Office (TTO) to facilitate such work. We define a TTO as any university or university foundation unit responsible for obtaining patent protection for university inventions and for licensing the patented inventions. It is important to keep in mind that furthering the public good, and not the financial awards, is the primary motivation for patent awards (Rooksby, 2013).

Within this context, faculty researchers and TTO research administrative staff are assumed and widely considered to be virtuous agents, charged with preserving certain core values while responding to pressures to change (Hansen & Moreland, 2004). However, there are many accounts whereby faculty researchers and TTO staff have not followed university policies nor provided adequate services, respectively. Examples include TTOs exercising favoritism and making exceptions to the rule (Nelsen, 2007; Owen-Smith & Powell, 2001; Rasor & Heller, 2006); supporting industry's special interests to the detriment of exercising university's core values (Olivieri, 2003); retaliating against whistleblowers (Irwin, 2007; Olivieri, 2003); contracting with patent trolls (Merritt, 2006); IP leakage (Bercovitz & Feldman, 2003; Cao, Zhao, & Chen, 2015; Heitner & Grant, 2010; Litan, Lesa, & Reedy, 2007b); and the faculty's unauthorized use of university resources for personal financial gain (Golden, 2012; Wingfield, 2013, 2015). All of these will be addressed in this paper.

This literature review attempts to capture, not only the "love" between faculty researchers and TTO staff when both view the relationship as constructive and productive, but also identifies and describes the "hate" relationship when parties are conflicted. Within the "hate" relationship, there are numerous ethical issues that surface. Insights are discussed regarding means by which these ethical conflicts can be minimized or avoided. Eleven recommendations are offered here along with recommendations that appear in the reviewed literature.

EXAMINING THE FACULTY/TTO RELATIONSHIP

Again, the purpose of this literature review is to provide a comprehensive picture of the university technology transfer environment, mission, and relationships between research faculty and TTO staff. We consider

conditions under which: (1) faculty "love" their TTO, (2) TTO staff "love" their faculty, (3) faculty "hate" their TTO, and (4) TTO staff "hate" their faculty. In particular, "hate" factors are given particularly considered as they can lead to conflict and resulting unethical behaviors.

When Do Research Faculty "Love" Their TTO?

Faculty "love" their university TTO when quality services are provided, such as helping them consult and collaborate with industry (Reilly, Kaye, Koehler, & Lempert, 2003). Evidence of quality services includes objective evaluations, well-resourced TTOs, and the fair and equitable distribution of patenting and marketing budgeted services (Nelsen, 2007). Adequately resourced TTOs require adequate patenting and marketing budgets, fewer bureaucratic delays, and adequate expertise (Jorgensen, 2005). However, most TTOs fail to cover their own expenses and do not have licensing revenue streams (Gewin, 2005). Most TTOs do not have the resources to patent technology as patenting is expensive (Jorgensen, 2005). TTOs that are successful are well resourced. Indeed, successful research universities reflect efficient and effective academic entrepreneurial cultures (Jorgensen, 2005; Sanberg et al., 2014).

Faculty also feel positive about their university TTO when the TTO enforces intellectual property (IP) policies that give faculty the ability to choose whether or not to actively participate in tech commercialization using the TTO as a service provider (Elfenbein, 2007). For example, the Wisconsin Alumni Research Foundation (WARF) does not obligate its faculty to use its TTO services unless the research is funded by the federal government (Litan, Lesa, & Reedy, 2007a, 2007b). This is termed as "free agency" and is touted as a means to speed up university tech commercialization. However, it is important to note that advocacy for free agency has upset some TTO directors. In fact, in 2010, there was a very public, heated debate in the Harvard Business Review between the Kauffmann Foundation's proponents of free agency and the TTO directors at Harvard and Stanford (Litan & Lesa, 2010). Litan et al. touts free agency as offering TTOs' some healthy competition (Litan, Lesa, & Reedy, 2007a, 2007b). Yet, some believe that TTOs should be replaced as evidenced by university inventors who operate from their departments and file their own patent applications, paying for their own patenting (Goktepe, 2007).

Some schools allow faculty to request that the disclosed invention be released back to them so that the inventors can do the leg work required

for tech commercialization (Elmer & McKinney, 2012; Rasor & Heller, 2006). Flexible tech transfer programs have options with respect to how commercialization is define and measured (Ziedonis & Ding, 2016). For example, the University of Michigan contracted with ARM, Ltd. for terms that exchange co-ownership in some of the university's patents with payment for research assistantships (Merritt, 2006). This helps students with the rising costs of graduate school and increases research productivity. In addition, some universities may allow faculty to participate in start-up businesses using the invention created with university resources (Capelli, 2006; Sanberg et al., 2014). This is permitted as long as the faculty member does not violate conflict of interest or conflict of commitment policies (Carney, 2001).

Furthermore, when faculty researchers decide to be actively engaged in university spin-off businesses that serve to commercialize inventions, it is recommended that the TTOs provide strong support to these efforts (Lerner & Soto, 2010). This support includes seed funding, venture capital and technical assistance such as providing business formation advice (Lerner & Soto, 2010).

Finally, faculty researchers "love" TTOs that are supported by university leadership that promotes and encourages a culture of academic entrepreneurship and values technology commercialization. Evidence of this support includes giving faculty researchers credit for their tech transfer activities in the tenure and promotion (TNP) process (Sanberg et al., 2014), financial incentives such as licensing royalty revenue sharing (Fini & Lacetera, 2010; Lach & Schankerman, 2004, 2008), patent award ceremonies for positive recognition, and robust public relations that promote the accomplishments of faculty researchers (Merton, 1957; Tornatzky, Waugaman, & Gray, 2002). Indeed, as Ku (2010) notes, faculty researchers are the TTO's customers and achieving customer satisfaction is critical to the success of the TTO.

Recommendation 1. To reinforce this "love" relationship, one best practice is for TTOs to manage faculty researchers' quality service expectations by providing adequate training about the technology transfer processes, realistic expectations that include quality discussions, and a description of how they can interact to build professional relationships.

When Do TTOs "Love" Their Research Faculty?

There has been a significant increase in licensing revenue generation at US research universities over the past two decades (Fig. 1). University leaders

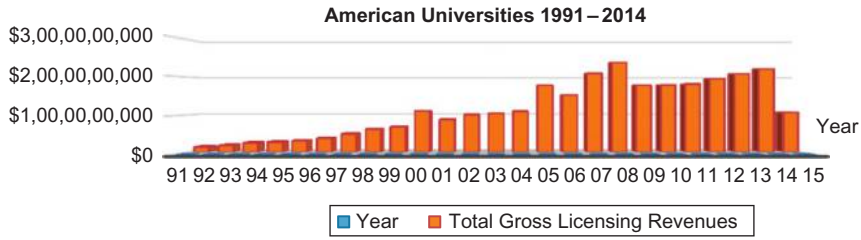

Fig. 1. Total Annual Licensing Revenues US Universities. *Source*: AUTM STATT Database.

are assisted by TTOs, as the leadership is under subtle pressure to show positive and increasing results with respect to closing licensing deals and generating IP licensing royalty revenues (Lee & Gaertner, 1994; Zemsky, 2003). This implies that TTOs appreciate, indeed survive on, being able to report success stories.

There have been numerous TTO success stories. For example, in 1965, a University of Florida professor developed the high energy drink Gatorade, which results in continued royalties to the university each year ($4.5 million annually reported by Blumberg in 1996 (Blumberg, 1996)). In 1999, Columbia University earned approximately $100 million of its $1.5 billion budget from patent licensing revenues. This money is reinvested into further research (Arenson, 2000). By 2013, blockbuster patents on inserting foreign DNA into cells brought a total of $790 million to Columbia University. In 2014, WARF was able to give $70 million back to the University of Wisconsin-Madison for its research-related endeavors (Muehl, 2014).

TTO staff members are under pressure to perform well with respect to making real contributions to economic development through the use of licensing (Wheaton, 2006). They rely heavily on their faculty researchers' participation in the technology transfer process. This is evidenced by the fact that a survey of TTO staff indicated that they perceived that 71% of the inventions they licensed could not be successfully commercialized without faculty cooperation in further development (Thursby & Thursby, 2004). Indeed, the preeminent trade association for university technology transfer specialists, the Association of University Technology Managers (AUTM), conducts an annual survey reporting university TTO rankings on licensing revenue.

Performance in the university technology transfer setting is related to (a) the marketability evaluation of the invention disclosure, (b) whether the

TTO staff select the invention disclosure for patenting, and (c) how much the academic inventor helps during patent prosecution and licensing endeavors (Moore, Wakeman, & Gino, 2014). When performance expectations go unmet, the academic inventors are likely to experience psychological tension with their TTO and will be motivated to resolve this tension through means that are either ethical or unethical. Next we consider conditions where the faculty/TTO staff relationship are in conflict.

When Do Research Faculty "Hate" Their TTO Staff?

There are instances when faculty researchers choose not to disclose their research results to their TTOs. Faculty may choose not to engage in technology transfer processes if it conflicts with their tenure and promotion policies, delays publication, and hinders their overall professional advancement (Markman, Gianiodisa, Phan, & Balkin, 2005). Faculty researchers "hate" TTO staff that engage in unethical behaviors such as showing favoritism in their decisions to invest limited financial resources in patenting and marketing faculty inventions (Nelsen, 2007). Moreover, TTOs are also likely to be resented when their service expectations are not managed or met, or when no or inadequate IP training or outreach is provided. This is because TTO training and outreach are considered best practices (Ku, 2010). In interviews with faculty researchers and TTO staff, 80% acknowledged the importance of engaging in outreach activities (Siegel, Waldman, Atwater, & Link, 2004).

When faculty researchers are ivory tower purists, they also have a disdain for TTO staff and for tech commercialization in general. In particular, some faculty do not want the TTO deals with industry partners to dictate the faculty researchers' research direction and decisions about what research the university will support (Arenson, 2000; Bowie, 1993). Many purists believe that industry scientists do not share, are secretive, are driven to patent and commercialize, and that university researchers should and are willing to be more transparent. Signing non-disclosure agreements and delaying publications are perceived to be muffling research (Williams-Jones, 2005). However, it has been demonstrated that they both share or do not share for a variety of reasons, and that academics' perception of industrial science is biased (Nelson, 2016; Sauermann & Stephan, 2013).

There have been several very public disputes between faculty and their universities. A very public example was described by Olivieri (2003) and Viens and Savulesco (2004). Dr. Nancy Olivieri of the University of

Toronto was caught in a heated dispute with an industry sponsor of her clinical trials at the Hospital for Sick Children. In 1995, Olivieri discovered that the trial for her drug discovery was placing patients at risk and she wanted to publish her findings. However, the sponsoring company urged her to remain silent and to not violate a non-disclosure agreement she signed.[1] Olivieri was dismissed for violating the non-disclosure agreement when she published her findings. Moreover, she was labeled a whistleblower. Legal action was threatened and the Canadian Association of University Teachers found that the University of Toronto did not do enough to protect her academic freedom. Olivieri was reinstated (Viens & Savulesco, 2004). She has subsequently argued that the politics that drives university technology commercialization has the potential to de-regulate drug approval procedures which is a threat to the public good. In fact, the President of her university lobbied on behalf of the company for changes to proposed drug patent regulations that were adverse to the drug company's self-interests (Olivieri, 2003; Viens & Savulesco, 2004).

Another example involved the renowned cancer researcher, Dr. Bob Pettit of Arizona State University. Pettit challenged the university's technology commercialization policies, with subsequent backlash. He disagreed with how his university was being managed (i.e., more like a corporation than a university), was very vocal about inventor rights, and he filed whistleblower complaints. Shortly after, he lost his cancer research lab (Irwin, 2007). Pettit accused the TTO staff of gross mismanagement, wasting funds and abuse of authority. The staff accused him of going "out of his way to make licensing agreements difficult" (Irwin, 2007). The TTO policy was to share revenues with inventors and their labs on licensing deals, but not sublicensing deals. His university licensed the patent at issue to OxiGene, who in turn, sublicensed it to Bristol-Myers Squibb for $70 million. When Pettit did not follow a university protocol to first notify the VP of Research over a material transfer agreement and patenting dispute, he was demoted to teach introductory chemistry.

These examples reflect an important ethics question: is it ethical to retaliate against whistleblowers? Whistleblowing is the act of exposing a wrongdoing by reporting it internally to an organization's management or externally (Ferrell, Fraedrich, & Ferrell, 2015). Andrade (2015) notes that external disclosures are often deemed disloyal and internal disclosures are favored because they are supposed to give an organization an opportunity to take corrective actions before being exposed to outsiders externally. Yet, when an organization retaliates against a whistleblower, it is retaliating against itself since employees are the reflection of their employers'

organizations (Andrade, 2015). Employees that observe wrongdoing should feel safe to report it. There should be measures to prevent the wrongdoing, detect it, and correct it. Organizations need standards for ethical behavior that are clear, supported by the organization's leadership, discussed and wrongdoings should be sanctioned (Kaptein, 2011).

Another example of a very public dispute was between Professor Doris Taylor of the University of Minnesota. Her university's TTO helped her found a spin-off business and hire a CEO. But the professor clashed with the CEO and allegedly, when she asked about finances and the business' direction, she was removed from the spin-off company's board (Kennedy, 2011). The university held a 28.6% equity interest in the company and a board member position. The board voted to fire her from the firm. Taylor stated that she was given a phone call with the news. This violates the ethics of caring which depends on natural caring and the innate acting on behalf of others (Noddings, 1984). The active moral virtue of caring is a commitment to the duty to maintain a caring attitude; and the relatedness of caring is a product of natural caring and the source of the duty and obligation to care (Noddings, 1984).

Below we consider the specific factors that create tension and potential ethical violations for both faculty and TTO staff related to TTO staff competencies and behaviors.

Unethical TTO staff: Some TTO staff become certified licensing professionals (CLP) by examination. There are CLP Rules of Professional Conduct (CLP Rules of Professional Conduct, 2014). Their duty to their clients is to act with honesty, fidelity, professionalism, and civility. CLPs are not to knowingly engage in dishonest, fraudulent, deceitful, or misrepresentative acts. The CLP is to notify their clients if they have a conflict of interest.

Within universities, conflicts of interest, and commitments are managed by research compliance officers. These conflicts reflect circumstances that create a risk that a professional's judgment and subsequent actions related to a primary interest will be unduly influenced by a secondary interest. Non-financial conflicts, such as biases in reviews of applications for grants or in peer review publications, are difficult to detect and prove (Beyer & Czernin, 2010). This is also true with regard to TTO staff's review of invention disclosures for patentability and marketability. Since revenue generation is an important performance measure, TTOs may favor the low hanging fruit such as those inventions with large commercial market appeal and a small number of faculty with proven track records (Rasor & Heller, 2006). Focusing on landing a blockbuster may alienate research faculty

who feel their invention disclosures receive curt, unsympathetic treatment. It fosters IP leakage and uncooperative behaviors by faculty researchers toward TTOs (Owen-Smith & Powell, 2001). Such inequitable behaviors on the part of the TTO staff are unethical as they deliberately conflict with the research university's mission to develop, reinforce, and support "all" research faculty in good standing, not just those that they may financially benefit from the most. Indeed, today, in a competitive metric-driven academic environment (e.g., total federal grant funding), it becomes easy to overlook certain faculty who need these services but aren't ready to deliver the blockbuster invention. In a sense, competitive metrics may be trumping ethical behavior. This should be a concern for all of us in academia.

As inferred in the above paragraph, a further examples of conflict occur when TTO staff are called upon to make exceptions to university policies in order to foster a large deal (Nelsen, 2007). These deals could include industry-sponsored grants, sponsored chairs, retention of a faculty researchers, or recruitment of an identified faculty researcher. A 2013 Canadian Association of University Teachers (CAUT) ethics report of an examination of 12 universities across Canada, raised concerns about the University of British Columbia's $9 million deal with Pfizer which bound the university to the Pfizer's interests (Munro, 2013). The report furthermore stated that 10 of the 12 universities received failing ethics grades because of closed door deals that violated the Canadian's policy for complete transparency.

Bok (2003) blames university presidents for wrongdoings since the presidents are charged with protecting the university's core values. Bok recommends that when seeking to protect a university's core values from the pitfalls of commercialization, the university should not rely on their presidents who are under enormous pressure to find money and to balance budgets. For example, in the 1980s, given an eroding technological manufacturing base, American universities were increasingly under pressure from both industry and government to contribute more to economic development and to develop economically viable technology (Lee & Gaertner, 1994). To this end, the University of Michigan was affectionately called Michigan, Inc. because its leaders pressed their academic colleges, institutes, faculty, and staff to identify and develop new markets that would offset revenue shortfalls (Zemsky, 2003). Presidents typically delegate to their Vice Presidents of Research, who may be charged with TTO duties or may delegate to a TTO staff (Siegel et al., 2004). Bok advocates that university leaders should not engage in one-offs and should not engage in the practice of considering commercial opportunities on a case-by-case basis (Bok, 2003). Instead, university leaders should promulgate and enforce general

rules related to corporate-research agreements and conflicts of interests for scientists. The problem with this solution is that, as noted by Nelsen (2007), universities have general rules and policies that get ignored by TTO staff when exceptions are made.

Recommendation 2: TTO staff should be required to demonstrate to their university leaders and university research foundation administrators that they are providing an equitable distribution of services and financial investments campus wide; and if not, they need to explain why they can't.

Recommendation 3: TTO staff should be required to demonstrate to their university leaders and university research foundation administrators that they have not violated any standing rules or policies when making the decision to patent and/or license inventions created with university resources; and if not, they need to explain why they can't. There needs to be total transparency and accountability for their actions.

Publish or perish: One of the primary reasons that faculty researchers are tempted to lose their virtue and choose to unethically violate university policy is the mere potential threat of having a publication delay. Publication delays can reduce a faculty member's chances for earning tenure, and is enough to prevent a faculty member from remaining virtuous. Indeed, it leads to significant job insecurity.

Research universities increased their engagement in technology transfer with the passage of the Bayh Dole Act of 1980 (Rogers, 2000). The Bayh Dole Act allows universities to license and sell technology created with federal funds. TTO staff members are charged with enforcing university policies that typically require faculty to divulge their inventions using invention disclosure forms. Faculty researchers are required to wait to publish their findings until the TTO staff conducts an evaluation of the invention for patentability and marketability. There are complaints by faculty that the evaluation process takes too long (Swamidass & Vulasa, 2009). Faculty may be anxious to disseminate their findings and some may want to actively commercialize their potentially profitable products themselves (Capelli, 2006; Elmer & McKinney, 2012; Litan & Lesa, 2010; Litan, Lesa, & Reedy, 2007a; Sanberg et al., 2014). Inventions created using university resources are often deemed university owned IP according to university policies. University resources can include, but are not limited to, use of university equipment, office and lab spaces, labor (i.e., doing research on university time). Failure to disclose inventions created with university resources is deemed unethical as it directly violates university policies.

Significant delays in the university technology transfer offices' evaluation of faculty researcher's invention disclosure can thwart opportunities for

faculty researchers to publish their research findings in a timely manner. When faculty do not submit their invention disclosures and risk violating university policy to avoid the risk of publication delays (Bercovitz & Feldman, 2003; Cao et al., 2015; Litan, Lesa, & Reedy, 2007b), they can be accused of taking university inventions "out the back door." In fact, almost 30% of university inventions are estimated to be commercialized in this manner (Heitner & Grant, 2010).

Universities want to commercialize discoveries from their labs more swiftly (Schramm, 2004). Promising university creations are often stuck, mired in the depths of bureaucracy, the lack of applied TTO skills, and limited resources. Efforts made by TTO staff to increase awareness and to simplify administrative processes may encourage invention disclosures and patent applications, but they do little for licensing. Licensing requires institutional capacity and resources to understand and react to market dynamics, commercial opportunities, and diverse interests of industry (Wu, Welch, & Huang, 2014). Thus, the reality is that many promising research findings consistently fail to be developed and brought to market for practical use. In the end, more must be done to rapidly and efficiently move technology from research universities into the commercial market place (Schramm, 2004).

As noted above, once an invention is disclosed, the TTO's technology transfer specialists evaluate the inventions for patentability and marketability. If the invention is the result of industry-sponsored funding, the faculty researcher typically has to wait until the TTO gives them publication clearance. Time delays are very real problems that may result in a diminished motivation for academic inventors' to be fully engaged in university technology transfer processes and to work closely with TTO staff. TTO staff have admitted that when university research is sponsored by a company, its representatives often ask researchers to delay publishing their findings 30–90 days so the company can review whether the paper contains confidential business information, and the TTO staff can guarantee that the faculty can publish their results (Foster, 2004). This waiting time is a clear disincentive for faculty.

Since patenting and marketing can be expensive investments, the decisions are carefully made. However, during this evaluation period it is best that the faculty researcher not disclose the invention publicly. Most TTOs require that the faculty wait to publish until the decision has been made on whether or not to file for patent protection. The TTO can invest in patent protection as an at-risk filing without a licensor and wait for the market to catch up, or license the technology to a company that is willing to invest in

the patent protection (Knight, 2003). It is harder to market inventions without patents (Jorgensen, 2005). If the decision is made not to patent or to pursue a license, the faculty researcher is only then notified that publication is appropriate. If the decision is made to file for patent protection, the researcher must wait until the patent application is filed. Most TTOs use outside patent counsel to file for patent protection. This creates another delay in the researcher's ability to publish their findings.

First market entry advantage: Besides posing barriers to faculty achieving their personal goals, delays can thwart opportunities for universities to get their marketable and patentable inventions into the commercial market place (Markman, et al., 2005; Siegel, et al., 2004; Siegel, Veugelers, & Wright, 2007; Siegel, Waldman, & Link, 2003). The irony is that the TTO staff is responsible for reviewing a variety of proposed agreements related to faculty research results to make sure that the clauses do not impose delays and restrictions on publications (Winickoff, 2013). Yet, in order to do so, the TTO reviews of these agreements may cause publication delays as well.

Recommendation 4: The TTOs need to go out of their way to ensure that faculty researchers are able to publish their findings. Thus, speed in the review process and patenting and licensing decisions is critical. TTOs need adequate human and financial resources to carry out this service more efficiently and effectively. In an environment of diminished funding, as this activity brings in funding and builds reputation for the university, this is one budget item that should be prioritized and not compromised.

Incompetent TTO staff: Some faculty researchers choose not to participate in the technology transfer process. This may be due to published findings of TTO lack of expertise (Jorgensen, 2005; Merritt, 2006), feelings that the TTO lacks the resources to take care of their research results (Gewin, 2005), and in particular, untenured faculty may feel that participating is too risky with respect to their chances of getting tenured if tech transfer activities do not weigh enough in faculty career and tenure decisions (Sanberg et al., 2014). Due to budgetary shortages, with respect to processing speed, the TTO staff may lack experience and competence (Siegel et al., 2004; Swamidass, 2009). They may also have a difficult time negotiating licensing deals with industry; and speed in closing these deals is critical (Gewin, 2005; Lerner & Soto, 2010).

For example, for two years, Hewlett-Packard (HP) tried to close a deal involving nanotechnology IP at UCLA and the University of California system had to get involved to resolve disputes and close the deal (Merritt, 2006). HP had begun to go to China, India, Russia, Brazil, and Singapore

for university research and development (Merritt, 2006). A great deal of promising research is going untapped and does not see the light of day and TTO inefficiency is partly to blame (Gewin, 2005; Jorgensen, 2005). This may be one reason that some faculty researchers choose to side-step the university technology transfer process.

TTO staff competence and full time equivalent (FTE) staffing have both been empirically studied. In a survey of 91 TTOs regarding the average educational qualification and size of TTO non-legal and technical staff, Swamidass and Vulasa (2009) found that:

- 13% of staff had a BS,
- 21% of staff had a MS,
- 33% of staff had either a MBA or Phd,
- 71% of staff had at least 8 yrs of experience, and
- 72% of TTOs had 3 or less staff members.

Despite the fact that 33% of staff memebers have MBAs, these researchers note that some academic inventors do not see the value of university technology transfer since there is evidence that TTOs are often either too narrowly focused on a small set of technical areas, or too focused on the legal aspects of licensing, with the marketing aspects too often given short shrift (Siegel et al., 2004). Marketing expertise among TTO staff is often inadequate, and more often, most of the TTOs do not have personnel who are skilled in marketing. TTO staff tend to have expertise in patent law, IP licensing or technical expertise (Siegel et al., 2004; Swamidass & Vulasa, 2009). This raises the ethical question if faculty are expected to participate in technology transfer and their tenure and promotion is a function of their research productivity, what happens when universities don't adequately support their stated requirements?

Another concern centers upon the degree to which the TTO staff connects with a viable commercial network. In many instances, the faculty researchers are better connected since they routinely present their research at trade conferences and reach out to industry for sponsored funding (Thursby & Thursby, 2004). Again, faculty members have voiced concern that if a TTO staff member began to dialogue with the faculty members' industry contacts, this could either help or hinder the faculty member's own industry connection. Faculty are critical of university-industry licensing because, without faculty, there would be no university inventions to license, and faculty often identify licensees, as well as working with licensees in further development (Thursby & Thursby, 2004). TTOs play a lessor role in commercializing technology when the academic inventor has

pre-transfer contacts in the business community (Harmon et al., 1997). Thus, mutually supportive connections between commercial industrial and academic activities would increase the rate of faculty disclosures, driven by their perceptions of the potential outcomes and benefits of patenting (Owen-Smith & Powell, 2001). TTOs should provide assistance to faculty in network building and relationship marketing efforts (Harmon et al., 1997).

Publishing papers is more important than patenting in both the United Kingdom and the United States (Decter, Bennett, & Leseure, 2006). Rahm (1994) found that 53% of faculty researchers that network with industry personally, and are more likely to hold patents (aka "spanning" researchers), also reported that these firms have sought to prohibit or delay publication of research results coming from university/industry R&D interactions. Thus, the delays imposed on publications are not just TTO imposed (Rahm, 1994). However, once the message is made public that there are delays caused by the TTO, word spreads among faculty quickly and this has a devastating effect on the invention disclosure rates (Tahvanainen & Hermans, 2008). Faculty may resist industry partners' authority over their research which results from deals struck by the TTO, and may ignore the rules and ignore patents or contractual terms (Murray, 2010).

Recommendation 5: Universities need to invest more of their research budgets in well-educated, well-trained, competent TTO personnel who have experience in protecting, marketing, closing licensing deals, and business formations.

Recommendation 6: Universities need to embrace the idea of free agency and give the faculty researchers who are willing and able to protect and market their discoveries the option of doing so on their own, so long as the invention is not the result of federal government funding.

Thwarting ivory tower purity: For 35 years, perceived and real TTO and publication delays due to disclosure restrictions have been much debated in the scholarly literature and are viewed by some as thwarting open science and maximum knowledge diffusion (Baldini, 2008; Feldman & Nelson, 2008). At the very least, the restrictions frustrate faculty researchers that are anxious to publish their research findings. Part of the debate is the fact that if universities over-patent, they may be viewed as leaving the non-profit realm and becoming commercial actors that lose their experimental use rights (Kesan, 2009; Van Hoorebeek, 2004). There is a general concern and perception that university patent practices tend to fragment and lock up research (Foster, 2004). Ivory tower proponents who are against research universities over-patenting practices and becoming too commercial, often

advocate for open collaborations, free participant use agreements, and royalty-free licensing (Kesan, 2009).

Universities' inactivity and delays in commercializing the patents that they own may catapult them into the category of patent trolls as they surface and file patent infringement lawsuits (Lemley, 2007). Patent trolls are patent owners that lay low and then take a mature industry by surprise with patent infringement litigation. This is done after industry developers have made irreversible investments and is known as the hold-up or troll problem. This is another reason some faculty researchers are reluctant to participate in the university tech transfer process. The faculty researchers may not want to be a party to a process that has such negative connotations.

Patent troll companies strike deals with TTOs to manage the university's patent portfolio and they use very intimidating, abusive litigation strategies to do so. Thus, some faculty researchers are opposed to the TTOs that use of patent trolls. In 2006, the University of California at San Diego (UCSD) entered into a contract with Intellectual Ventures (IV), a company that bought or agreed to manage patents from universities and colleges in order to pull whole patent portfolios together which could be licensed to established and newly formed companies (Merritt, 2006). The TTOs and IV were to share licensing royalties; and the fear of assertion licensing existed. UCSD's TTO director stated that it was because at times TTOs do not have the money, time, or expertise to do this on their own.

In 2015, the Association of American Universities (AAU) and the Association of Public and Land-grant Universities (APLU) issued a press release urging TTOs that use patent troll companies to enforce their patents against alleged infringers. Patent troll companies such as Intellectual Ventures (IV) have been accused of suppressing innovation and product development by blocking other innovators by charging usurious fees and getting court ordered fees. The ethics of university investment in the patent trolls' abusive approaches have been questioned (Hargarten, 2012). The AAU and APLU asked universities to stop dealing with patent trolls and to put restrictions in their university policies (APLU, 2015). Ferrell, Fraedrich, and Ferrell (2015) note that perceived wrongdoing and questionable behavior leads to aggressive campaigns like the AAU and APLU stance. Organization's level of social responsibility can be assessed by scrutinizing how they address issues of concerns to its stakeholders (Ferrell, Fraedrich, & Ferrell, 2015).

Recommendation 7: TTOs should avoid entering into contractual deals with patent troll companies because addressing ethical concerns of importance to its stakeholders (i.e., the faculty) is an act of social responsibility.

When Do TTO Staff "Hate" Their Faculty Clients?

Faculty researchers that disclose inventions at the last minute: The TTO staff experience stress when a faculty member submits invention disclosures right before presenting their findings at a conference (Heller, 2009). This gives the TTO very little time to work on evaluating the invention and protecting it if necessary. In a sense, such behavior is an ethical violation of university expectations regarding what is reasonable and appropriate functioning between faculty and the TTO.

Faculty researchers can delay the tech transfer process: The faster TTOs can commercialize patent-protected university technologies, the greater their licensing revenues and the more start-up spin-off ventures they can form (Markman et al., 2005). The time required to commercialize an invention via marketing and licensing depends on the participation of faculty-inventors in the tech transfer process. Faculty have expressed concern about the time commitment involved in participating in tech transfer and the reduction in time devoted toward teaching (Sterckx, 2011). However, faculty researchers can hinder or help the licensing process by extending or reducing the time to commercialization (Markman et al., 2005). In a survey of life science researchers in Denmark, those most skeptical of technology transfer were scientists oriented toward basic research, recipients of research council grants, scientists with close relations to industry, and full professors (Davis, Larsen, & Lotz, 2011). This is perhaps the most serious and egregious example of a faculty researcher choosing to behave unethically by selecting not to participate in their university's tech transfer process.

With respect to delays, many of the problems that academic inventors may perceive will result from the university technology transfer process may, in fact, be unsubstantiated. In a study commissioned by the National Academy of Science (NAS) Board on Science, Technology, and Economic Policy (STEP), 70 interviews were conducted with IP attorneys, business managers, and scientists from 10 pharmaceutical firms and 15 biotechnology firms, as well as university researchers and technology transfer officers from six universities, patent lawyers, and government and trade association personnel (Walsh, Arora, & Cohen, 2003). They addressed whether the proliferation of patents had resulted in failures to license beneficial patented technologies and whether patents on upstream discoveries had impeded subsequent research. Walsh et al. (2003) reported few problems as only a scant number of ongoing R&D projects stopped due to patent problems. However, with respect to knowledge sharing, these researchers noted significant concerns with increasing secrecy of scientists and with the ability

of scientists to share or to obtain access to physical materials needed for research. In addition, the process of negotiating material transfer agreements had become significantly longer, resulting in delays of research and in exceptional cases in abandonment of research (Sarnoff & Holman, 2008; Walsh et al., 2003),

In a subsequent study, Walsh and his colleagues studied 398 biomedical researchers at university, government, and non-profit institutions (Walsh, Cho, & Cohen, 2005). Nineteen percent received research funding from industry, 22% applied for a patent in two years prior to the Walsh study, and 35% had some business activity such as IP rights negotations, business planning, product marketing, or licensing income. Only 1% of the respondents suffered from a project delay of more than a month due to patenting. None of these researchers experienced a hindered project due to the existence of third party patents on research inputs.

Recommendation 8: University IP policies, faculty handbooks, and faculty manuals of operations need to emphasize the need for faculty researchers to plan ahead in submitting invention disclosures in a more timely manner, and failure to do so presents a violation of policy.

Recommendation 9: The TTOs' reliance on faculty participation and engagement needs to well articulated and their collaborative relationships need to be nurtured.

Intellectual and real property leakages – ignorance is not bliss: IP law is very complex and esoteric. Some faculty claim to be ignorant of their university's IP policies and rules. It is unethical to ignore rules and take university owned IP "out the back door." They often do not read or reach a full understanding of the clauses in their grants and contracts. To thwart IP leakage, the Scripps Research Institute reviews every manuscript written by its faculty for potentially patentable discoveries before they are submitted to journals for publication (Knight, 2003).

In 2015, two faculty researchers at the University of Connecticut did not read the fine print and the National Science Foundation (NSF) suspended millions in grants to the school. The faculty used $250,000 in grant funds to purchase equipment from a company in which they had significant financial interest. What does this have to do with tech transfer? Well, the loss of NSF funding hinders the ability of the researchers to develop inventions that feed the university tech commercialization pipeline. Thus, the unethical use of university lab space, students and equipment for self-interests is a real concern.

In 2010, the Georgia Bureau of Investigations raided Georgia Tech's Professor Joy Laskar's university offices and home. Laskar was accused of

not fully divulging his involvement in the university spin-off company Sayana. Laskar and Sayana management were accused of the unauthorized use of university lab space, equipment, and other resources (Wingfield, 2013, 2015). Interestingly, Georgia Tech purportedly did not discuss these university policies with Laskar prior to the public arrest and termination of his position.

In 1997, Professor John Reece Roth of the University of Tennessee was granted a patent with two co-inventors. In 2000, one of the co-inventors of plasma technology founded a start-up that was awarded the US Air Force contract after the university granted it an exclusive license to the patents. Roth had a small ownership share in the firm. In 2005, the firm was awarded a contract just under $750,000 with the US Air Force and Roth and the University of Tennessee were awarded a $73,000 subcontract. In 2008, Roth was imprisoned for violating the Arms Export Control Act (AECA). He used Chinese and Iranian students on US Air Force research, which restricted the use of such students. He also took restricted files to China on his laptop. The project planned to incorporate the plasma actuators into military drones. A university official who reviewed the subcontract missed the export control clause and so did Roth (Golden, 2012). However, university officials instructed Roth to take none of the project materials with him to China.

Was it an accident or unethical negligence of duty to engage in due diligence? Typically, allegations of behaving unethically depend on patterns of behavior. How closely are contract terms read by university staff and faculty researchers? On appeal, the US Appellate court stated that willfulness is to know of the general unlawfulness of your conduct. Roth pleeded ignorance of the law as his defense and that was frowned upon on appeal (United States of America v. John Reece Roth and Atmospheric Glow Technologies, Inc., 2011).

Recommendation 10: There should be mechanisms in place for faculty researchers to be able to openly express their opposition to tech transfer practices about which they are concerned. TTO staff and other university administrators should not retaliate against whistleblowers and should be held accountable when they do.

Recommendation 11: TTOs need to provide adequate legal education to faculty researchers. It is imperative that both the TTO staff and faculty researchers understand government regulations, and contract terms and conditions. No one should ignore these legal requirements.

IMPLICATIONS

The previous section provided a review of literature that reflects when faculty and TTO staff are appreciated by one another, and when tensions and resulting conflicts arise. Regarding the latter, this review closely examines these faculty/TTO tensions in light of potential ethical violations. This review of the literature led us to the conclusion that faculty researchers and university tech transfer specialists may be feeling insecure about their jobs and livelihood, and thus working with each other has direct potential professional threats. Thus, in the university technology transfer context, to address the conflict between what motivates the TTO staff versus what motivates faculty researchers, a micro-level examination of individual self-awareness and values may prove insightful. Although macro-level motivational theories and tactics in the area of transformational leadership are helpful, a micro-level analysis will likely shed significant light on the specific causes of job insecurity felt by both parties in the university technology transfer setting.

The study of job insecurity is complicated. Faculty researchers and TTO staff will likely feel a distressing level of insecurity within the university technology transfer setting if they are not achieving their own goals and meeting university requirements. Faculty researchers may not likely be motivated to remain as virtuous or avoid breaking rules related to disclosing their inventions if they feel significant job insecurity. Likewise, TTO staff may circumvent service practices to maximize their job security. Table 1 reflects factors found in the job security literature that may impact felt insecurity within the university technology transfer environment. Some of these factors are positively framed while others are negatively framed, this is a direct result of how they were presented in the literature.

We further suggest that both faculty researchers' and TTO staff's perceived job insecurity is the underlying cause of ethical violations. Both stakeholder groups want to report success stories. Such productivity is critical for their job security. However, sometimes the ethical lines get crossed. The implications for crossing these lines include possible loss of jobs, research funding, research labs, patent licensing revenue, and scientific reputation. Further, the need to more closely monitor faculty researchers and TTO staff may lead to increased distrust.

CONCLUSION

Faculty researchers and tech transfer office (TTO) staff are perceived to be virtuous agents. However, there are many accounts whereby faculty

Table 1. Potential Factors Impacting Job Security within University Technology Transfer.

Category	Factor	Literature Support
Internal to the person	Employee resistance to change	Greenhalgh and Rosenblatt (1984)
	Perceived lack of predictability and control over matters	Chirumbolo and Areni (2010)
	Felt role ambiguity	Ashford, Lee, and Bobko (1989)
	Perceived conflicting expectations stemming from inter-role conflict and role overload	Ashford et al. (1989)
	Feelings of powerlessness	Ashford et al. (1989) and Greenhalgh and Rosenblatt (1984)
	Perceptions of a lack of leadership support	Ng, Sorensen, and Sorensen (2008)
External/ environmental	Presence of organizational communication that increases a sense of control and predictability	Vander Elst, Baillien, Cuyper, and De Witte (2010)
	Implementation of transformational leadership motivational tactics	Grant and Berry (2011)
	Reinforcement of high levels of autonomous motivation	Reinholt, Pedersen, and Foss (2011)
	Managerial peer reputation of trustworthiness	Blau (1964) and Whitener, Brodt, Korsgaard, and Werner (1998)
	Supportive exchange relationships with peers and leaders	Schaubroeck, Peng, and Hannah (2013)
	Presence of status dominated power source mismatches that hinder inter-organizational relationships	Ma, Rhee, and Yang (2013)
	Bureaucratic control that leads to worker resistance in the form of employees defending autonomy	Hodson (1995)
	Mismanagement and incompetence that leads to work resistance in the form of employees deflecting abuse	Hodson (1995)

researchers and TTO staff have not followed university policies and expectations. For example, faculty failure to disclose inventions created with university resources is unethical. TTO staff's negligence in servicing their faculty clients is unethical. On the other hand, faculty members who have received effective technology transfer services from TTOs "love" these research administrators. TTO staff that experience the joys of teaming with cooperative faculty researchers "love" these faculty clients. This is especially true if there are resulting success stories. This study reflects this love/hate relationship between faculty and TTO staff.

This review reveals there are several reasons that research faculty and TTO staff unethically violate university policies or otherwise hinder the university tech transfer process. We propose that feelings of job insecurity cause distress in both the faculty researchers and tech transfer staff. Eleven recommendations are offered along with those recommendations that appear in the literature. It is hoped that these recommendations will help resolve specific tensions that result in unethical conflicts.

While we provided this set of specific recommendations, our overall recommendation is that faculty researchers and TTO staff need to be enlightened with training and robust engagement. Improved communication, information sharing, and relationship building is required to alleviate the felt tensions between the faculty researchers and TTO staff. In fact, ethical awareness and behaviors can be taught early, continually and frequently. Furthermore, faculty and TTO staff can be trained in aspects and tool of collaborative communication (Peters & Schumann, 2016) to facilitate more constructive dialogue. Ethics governing faculty researchers' responsibility is not taught in most doctoral programs (Austin, 2003). Future faculty researchers and TTO staff, and other aspiring academic administrators can begin to internalize an ethical lens toward scientific misconduct when they are in undergraduate and graduate programs. Expected behaviors can be illustrated to alleviate confusion. If communication, ethics education, and information sharing are increased and made easily available to all stakeholders, then we are likely to experience a decrease in possible ethical violations within the technology transfer environment and a lessened need for the intense scrutiny of faculty and TTO staff that now exists. In closing, we want to reinforce the need for future research that examines this relationship and furthers our understanding of the ethical considerations that exist within the technology transfer process.

NOTE

1. Although today non-disclosure agreements are the responsibility of TTOs, this was prior to the university having a TTO because an Expert Panel on Commercialization of University Research did not recommend tech transfer until 1998; and the panel was comprised mainly of corporate officers.

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