# Potential Conflicts of Interest in Academic Entrepreneurship

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## Abstract

Many universities encourage academic researchers to participate in technology commercialization and entrepreneurship to demonstrate economic and societal returns from investments in research and innovation. Shifting focus from traditional academic responsibilities to more entrepreneurial ones can introduce conflicts of interest for faculty and student researchers involved in commercialization activities and business transactions. This paper synthesizes potential conflicts of interest pertinent to faculty and graduate student researchers engaged in academic entrepreneurship activities. The objective is to raise awareness of potential issues so they can be managed to benefit both the institutions and individuals involved.


## Introduction

Universities are increasingly encouraging faculty and graduate students to translate their research outcomes into practical applications through an activity referred to as “academic entrepreneurship”. This movement is driven by a growing need to show policymakers and stakeholders the economic and societal benefits of investing in basic research (Audretsch, 2014; Barr et al., 2009). To support this, universities have developed programs, infrastructure, and policies to promote involvement in technology commercialization and entrepreneurship. The result is a significant increase in patents, licensing agreements, and new ventures emerging from universities over the past two decades (Robbins, 2024).

Shifting focus from traditional academic responsibilities to more entrepreneurial ones can introduce potential conflicts of interest (COI) for academic researchers who are exploring markets for their innovations and engaging in business transactions (Wright & Phan, 2018). COIs occur when faculty, researchers, or university administrators' personal, financial, or professional interests influence their objectivity, decision-making, or fulfillment of institutional responsibilities (Thursby et al., 2001). In academic entrepreneurship, this can include introducing bias into the design or reporting of research, lacking objectivity in student mentorship, and delays in publishing where patents are concerned. While many measures are in place to prevent COIs, it is our experience that many academic researchers are unaware of potential COI issues. Further, there is evidence that COI policies and practices have historically focused more on faculty involvement in commercial activities than graduate students (Cho et al., 2000).

The purpose of this paper is to identify and synthesize key conflicts arising from involvement in technology commercialization activity and examples of practical approaches universities use to mitigate them. It is inspired by comments collected from STEM graduate students enrolled in a technology entrepreneurship course. The comments highlighted a lack of awareness of potential conflicts despite many becoming involved in entrepreneurial activities. The paper draws on policies and practices enacted by major research universities across the United States that wish to encourage entrepreneurial activity while maintaining academic integrity and public trust. The goal is to raise awareness of these issues, which can have important implications for faculty and graduate student research, publishing, funding, and careers.

# Literature Review

## Academic Entrepreneurship

Academic entrepreneurship refers to the activities in which faculty, students, and researchers become involved to translate research, knowledge, and innovations into commercially viable products, services, and entities. These activities include patenting, the founding of startup companies, consulting, and licensing agreements with industry, all of which generate economic development and societal impact from academic science (Etzkowitz, 2003; Rothaermel et al., 2007). Shifting attention to entrepreneurial outcomes represents a change in how universities see their mission in response to economic pressures, funding constraints, and the evolving expectations of higher education.

The Bayh Dole Act passed in 1980, is the legislation that allowed US universities to own patents emerging from federally-funded research (Mowery et al., 2001). Before the Act, the federal government owned inventions emerging from government-funded projects. Granting universities ownership and management of their patent portfolios was viewed as a way to promote technology transfer, research commercialization, and collaboration between academia and industry. Universities could demonstrate research's societal and economic impact by developing new technologies, products, and services. They could also benefit from licensing agreements with startups or established companies (Mowery et al., 2001). Other secondary advantages were enhancing their ability to recruit and train top faculty and students, creating employment opportunities for graduates, and enhancing local and state economies.

Many policies, practices, and resources have been put in place to encourage and facilitate academic entrepreneurship. These include financial incentives, technology transfer office (TTO) support, business incubation assistance, entrepreneurship training, seed funding, leave policies, and recognition of entrepreneurial activities in tenure and promotion processes (Baldini, 2006; Baldini et al., 2007; Thursby & Kemp, 2002; Thursby & Thursby, 2002). Beyond universities, federal agencies have developed initiatives and training programs to support academic entrepreneurship. Most prominently, the National Science Foundation launched the Innovation Corps (I-Corps) program in 2011 to bridge the gap between federal investments in research and the marketplace. I-Corps trains faculty and graduate students using a "customer discovery" methodology, which focuses on validating market demand and developing business models (National Science Foundation, 2012).

These activities have led to philosophical and practical concerns related to how academic entrepreneurship impacts the behaviors of researchers and how it "shifts in the amount, direction, and quality of scientific research" (Roche, 2023, p. 961). These concerns are important to acknowledge when discussing university policies and practices related to COIs. For example, some believe that academic researchers may become more focused on applied research at the expense of fundamental research (Blumenthal et al., 1996), less open diffusion of knowledge (Murray & Stern, 2007; Nelson, 2004), and that more may move to industry positions if they become involved in entrepreneurial activities (Azoulay et al., 2007).

Today, the prevailing view of university leaders is that commercial activity complements traditional scholarly activity, thereby enhancing the impact and relevance of academic research

(Thursby & Thursby, 2010). Nevertheless, despite potential advantages, concerns arise when entrepreneurial ventures divert time and resources from teaching and research, when commercial outcomes influence research priorities, and when graduate students must balance education and business activities (Harman, 2022). These concerns must be addressed transparently to create an entrepreneurial culture that safeguards academic research integrity, diversity, and openness.

**Participants and Stakeholders**

Academic entrepreneurship initiatives typically target faculty, research scientists, postdoctoral researchers, and graduate and undergraduate students in engineering and science disciplines who are deeply involved in developing technologies with potential societal and economic impact. Research professors are the primary drivers of academic entrepreneurial activities because they often generate innovations and inventions given their access to university resources, and are thus well-positioned to commercialize their discoveries (Hayter et al., 2017; Wright et al., 2017). Postdoctoral researchers and research associates, who serve as the technical backbone of research projects, also contribute to commercialization efforts. Graduate students, who serve as research trainees and collaborators, can acquire entrepreneurial skills through training and mentorship. We describe the roles of these stakeholders below.

Faculty

Faculty members become involved in technology commercialization and entrepreneurship activity for various reasons. It can be in response public policy, institutional incentives, organizational culture, or motivational factors at an individual level (Cohen et al., 2020; Czarnitzki & Toole, 2010; Goldstein, 2010; Roche, 2023).

Allowing researchers to have a personal financial interest in commercializing inventions is not a practice commonly allowed by private companies. More typically, companies own the intellectual property developed by their employees and reap the benefits thereof. According to Biancamano (2002), there are four reasons why academic researchers are permitted to do this: 1) Incentivizes Commercialization - enabling researchers to benefit personally from their innovations can motivate the pursuit of commercially viable technologies; 2) Faculty Attraction and Retention – offering opportunities for faculty to participate in startups is crucial for attracting and retaining top talent; 3) Economic Impact - university-based startups offer potential for local job creation and economic growth, which aligns with the public service missions of large research institutions; 4) Revenue Generation - there is the potential for startup involvement to generate revenue for universities.

The direct involvement of faculty in technology commercialization is considered crucial to the success of academic ventures, given their deep technical expertise and ability to bridge the gap between discovery and market needs. Research has shown that faculty's direct engagement in patenting, licensing, and startup creation significantly increases the likelihood of successful commercialization outcomes (Shane, 2004).

Participating in entrepreneurship training can also have secondary benefits beyond creating startups. For example, interviews with NSF I-Corps participants found that faculty used the market feedback collected during the training to pivot their research. They were also more

interested in teaching entrepreneurial concepts in their courses and hiring graduate students and postdoctoral researchers with an entrepreneurial mindset (Duval-Couetil, Huang-Saad, et al., 2021).

Graduate Students and Postdoctoral Researchers

Graduate students and postdocs/research associates are equally critical for success in academic entrepreneurship, given their hands-on experience with research methods and early-stage involvement in technology development activities (MacDonald & Williams-Jones, 2009). Research shows that their direct involvement in academic startups complements faculty efforts through technical and operational support (Boh et al., 2012; Hayter et al., 2017). They tend to have fewer time commitments than faculty. Students can also access entrepreneurship education and competitions, which provide access to entrepreneurial networks and funding sources outside the university.

Some propose that graduate students and postdocs are better suited to take on leadership roles in university startups because of their specialized and interdisciplinary knowledge, as well as their aptitude for "original thought and problem-solving, and these attributes should enable a certain cohort to develop careers as entrepreneurs" (Dooley & Kenny, 2015, pp., p. 95)). The NSF recognized the important role that graduate students and postdocs play in the entrepreneurial process by assigning them the Entrepreneurial Lead (EL) role on I-Corps teams. This role was not assigned to faculty because most are unlikely to leave academia to lead a startup (Duval-Couetil, Huang-Saad, et al., 2021; Hayter et al., 2017).

Professional development benefits are another reason for involving graduate students in academic entrepreneurship. Doctoral training remains very specialized, providing graduates with few management skills when many will be working in businesses (Dooley & Kenny, 2015; Sauermann & Roach, 2012; Wolfgramm & Zhou, 2024). (Manathunga et al., 2006). Entrepreneurship can contribute to professional development and interdisciplinary knowledge through business literacy, problem-solving, communication, collaboration, and networking, better preparing graduates for a broader range of careers (Duval-Couetil & Wheadon, 2014; Wheadon & Duval-Couetil, 2014). It can also lead to industry becoming more entrepreneurial, and create stronger connections between academia and companies (Dooley & Kenny, 2015).

Other Academic Entrepreneurship Stakeholders

Many stakeholders in the entrepreneurial ecosystem can influence faculty and graduate students' entrepreneurial development (Matlay, 2011). Deans and department heads oversee these activities. TTO staff manages intellectual property and facilitates translation into marketable products and services. University research administrators play a pivotal role through policies and activities that bridge research and innovation. With TTOs, research administrators ensure compliance with IP ownership policy, conflicts of interest, revenue sharing, and balancing institutional priorities and entrepreneurial goals. State and local industry, entrepreneurs, future employers, and the community are also important stakeholders in academic entrepreneurship. While they do not directly control or manage academic entrepreneurship activities, they are important secondary stakeholders, providing essential support, feedback, funding, and incentives that shape the success of entrepreneurial ecosystems.

**Graduate Student Understanding of Conflicts of Interest**

Several factors inspired our decision to summarize potential conflicts of interest affecting academic researchers. First, there continues to be a significant push to get more graduate students involved in technology commercialization through university-based initiatives or national programs such as the NSF's I-Corps. Second, in a class we teach on technology entrepreneurship and research translation (see Duval-Couetil, Ladisch, et al., 2021), we observed that graduate students had limited awareness of potential conflicts that can occur when engaging in entrepreneurial activity.

Each year, students in this course attend a lecture on COIs relevant to academic entrepreneurship, presented by an administrator from our university's Office of Research. After the last lecture, we asked students to reply in writing to the following questions: *What from this lecture was most surprising to you? What conflicts of interest had you not considered? What will you pay more attention to in the future?*

Select answers to these questions presented in Table 1. Responses confirm their prior lack of knowledge despite their interest and involvement in entrepreneurship. They highlight the multiple types of COIs relevant to faculty and graduate student entrepreneurs and the need to communicate these to stakeholders more effectively.

**Table 1**

*Graduate Student Comments Related to Potential Conflicts of Interest*

| COI Topic | Graduate Student Comments |
|---|---|
| **Financial Conflicts of Interest** | - *It was surprising to me how much financial conflict of interest is permissible if disclosed properly. My assumption before was that non-financial conflicts of interest such as personal relationships, prior work experiences, and conflict of commitments were permissible if disclosed because life is just messy, but I had figured FCOIs were avoided altogether.*<br>- *Among all, the FCOI was the most surprising and the most impressive part. I hadn't realized how easily financial interests, such as consulting fees, could actually create conflicts.* |
| **Conflicts of Commitment** | - *I was surprised on how time commitment could be a conflict of interest, I thought it was fine if one wants to work like 70 hours a week to start their business without reporting it. But apparently that is not allowed.*<br>- *This lecture was the first time I have learned about Conflict of Commitment. I was very surprised to learn how much the time spent outside of a project could interfere with the project itself, and how it would be identified as a noteworthy conflict. It makes me wonder to what extent an acceptable amount of time or effort would constitute a conflict when working on a project. This identifies the crucial need for teams to communicate expectations with regards to time commitments or work produced in order to avoid potential conflicts.* |

| | |
|---|---|
| **Advisor/Advisee Relationships** | - *One of the things that did not come to my mind was when faculty supervised students who were at the same [time] working for or providing services to the faculty member in [their] venture. Such parallel relationships cannot help but create an odd tension between professional and academic responsibilities and are likely to prejudice how the student's progress is evaluated. It is all so easy to envision how this form of conflict would practically go unnoticed yet has consequences that are fateful with regard to the student's learning process and authenticity of [their] work.* |
| **Graduation Delays** | - *What I found most surprising is how "reasonable" delay in graduation is allowed by COC rules. That publications may be delayed, I understand. But I think that delaying graduation is not a good thing, especially because the term "reasonable" may mean different amounts of time to different people, and can negatively impact a student's professional career. I think that departments should have policies in place to allow students who have been engaged in entrepeneurial activities and/or who have pending patent applications (and hence don't have publications) to graduate without having to meet publication requirements. After all, different types of work will require different ways of being shared with the community.* |
| **Processes and Paperwork** | - *The thing that I learned I would say is all the paperwork that comes about from involving student's in pursuing proprietary technology as a full fledged business while it being developed as part of a university IP.* |

To raise awareness of these issues, this paper summarizes scholarship and university policies into three main COI categories described in subsequent sections. It is important to note that elements of each category overlap and intersect.

**Conflict of Interest Definitions**

A conflict of interest is "a situation in which someone cannot make a fair decision because they will be affected by the result" (Cambridge Dictionary). As stated, COIs in academia arise when the personal, financial, or professional interests of faculty, researchers, or university administrators potentially compromise or appear to compromise their objectivity, decision-making, or responsibilities to the university (Thursby et al., 2001). These conflicts often stem from holding equity (ownership) positions in university-based startups, receiving royalties, or having financial ties to industry partners while conducting research, teaching, or overseeing university policies.

Conflicts of commitment are a type of COI that occurs when university employees' outside activities, whether paid or unpaid, interfere with their ability to fulfill their duties to the institution (Campbell & Slaughter, 1999). These can include situations in which effort is divided between a job and other commitments, such as personal activities, external business activities, or external professional activities. These do not necessarily involve financial interests or bias in one's judgment but, instead, a level of time commitment and effort inconsistent with their commitment to the university and its interests/mission (see definitions and policies from Vanderbilt University, Stanford University, and the University of Arizona).

Universities that are non-profit entities supported by public funds have legal obligations to appropriately manage conflicts and prevent issues like misuse of funds or intellectual property. Federal agencies (e.g., Health and Human Services, National Institute of Health, National Science Foundation, Department of Energy, Department of Agriculture) that sponsor academic research comply with federal regulations on individual and institutional COIs, and require institutions to have and publish policies that comply with these regulations (Cho et al., 2000).

COIs have implications at the institutional level, where there are many potential risks to a university's reputation if commercialization activities are managed improperly (Harman, 2022). In addition to personal interests, an institution's financial interests and business relationships can influence the design, conduct, or reporting of academic research. There are also legal implications for universities that take public funds but engage in private business activities. When COIs are not managed, a university risks its reputation, and public trust can be damaged (Harman, 2022).

**Category 1: Personal Interests versus Professional Responsibilities**

This category of COIs refers to the ethical dilemmas that arise when an individual's personal interest and involvement in academic entrepreneurship conflicts with their professional responsibilities. These dilemmas compromise decision-making, transparency, and trust within academic and entrepreneurial settings. Examples include the following:

<u>Financial Conflicts of Interest</u>

Faculty involvement in startups can lead to individual-level COIs when a person's financial stake in the success of a venture intersects with their university responsibilities (Harrington, 2000). In this case, faculty who hold equity in startup companies or receive compensation for serving as an officer for a company may face dilemmas where these financial interests conflict with their academic obligations. For instance, faculty could steer university-sponsored research toward outcomes that benefit their startups (Axler et al., 2018). Or, what might benefit a startup could influence purchasing decisions and grant applications. These activities can represent a misuse of university resources and the use of public funds for private gain.

Institutional-level conflicts of interest (ICOIs) occur when the financial interest of the university or a university official creates potential biases in research, education, or governance (Contreras & Rinehart, 2020). In the case of academic entrepreneurship, ICOIs may involve the equity stake universities take in startups, which may lead to promoting specific research projects and faculty members, influencing hiring and promotion, or research allocation decisions. They can also involve technology licensing decisions, where a university's financial interest may affect the selection of licensees and licensing terms. Faculty entrepreneurs serving as researchers and university administrators (e.g., dean or department head) can face individual and institutional COIs.

<u>Managing Time Commitments and Responsibilities</u>

The early stages of a startup require significant and often unpredictable time commitments that can easily exceed the one day per week that faculty are permitted for personal consulting under university policy at many institutions (on average and typically subject to the approval of

department heads). The time-intensive startup phase often involves developing viable prototypes, securing funding, building startup teams, and navigating regulatory and market challenges—all of which demand attention beyond what a standard academic schedule allows (Harman, 2022; MacDonald & Williams-Jones, 2009). Consequently, faculty may struggle to balance these entrepreneurial responsibilities with their primary academic responsibilities involving teaching, research, and administrative duties (Campbell & Slaughter, 1999).

Utilization of University Resources

Academic entrepreneurship can lead to the misuse of university resources, such as laboratories, libraries, servers, offices, equipment, supplies, and personnel, for a researcher's private ventures. For example, faculty may use university-maintained research facilities to develop a product or technology that directly benefits their startup. They may use software, databases, computational tools, or data generated through university-funded research for purposes beyond academic work. They may also assign startup work to graduate and undergraduate students or other research personnel funded by the university, blurring the line between academic responsibilities and commercial interests.

Sharing of Information

In the academic environment, openness and transparency are fundamental principles, and fostering the free exchange of ideas and the dissemination of research findings is important for advancing discovery and the public good (Harman, 2022). However, when faculty engage in startups, they may face pressure to withhold information or delay research publication to protect intellectual property or maintain a competitive advantage in the market (Cho et al., 2000). This withholding can strain relationships with students, collaborators, and peers who rely on timely knowledge sharing for their own academic and professional progress. Engaging in commercial activities can create pressure to disclose confidential information when serving on a scientific advisory board or interacting with potential funders of research or startups. Faculty may also encounter conflicts when deciding how to handle dual-use data or information valuable to both academia and their entrepreneurial ventures.

Relationships with Peers

The relationship between faculty entrepreneurs and their peers may also suffer when there is a perception of bias or favoritism, especially if the faculty member's decisions prioritize their startup over their university responsibilities. There can be conflict where some faculty and departments focus more on applied rather than basic research. There can also be dissension within departments if faculty entrepreneurs are favored and given more attention, funding, or release time than their peers.

Role Strain and Identity Conflict

Faculty and graduate students may experience role strain when navigating the dual identities of academics and entrepreneurs (Goode, 1960). Managing these dual roles can lead to stress and decreased performance in one or both roles, affecting overall productivity and professional relationships.

**Category 2: Research Bias and Objectivity Conflicts of Interest**

Financial interests and business partnerships may introduce bias into research design and reporting, impacting research integrity and security. This bias can manifest in the selective reporting of results, downplaying negative findings, or prioritizing research that aligns with a startup's goals (Harman, 2022). Potential issues include the following:

Selective Data Reporting

Researchers involved in a startup or commercial activity might be tempted to present select data or manipulate data, either intentionally or subconsciously (Cho et al., 2000). This can involve focusing on specific datasets that align with the desired outcome for a venture, or altering data or its presentation. In extreme cases, this can lead to falsifying results, undermining scientific integrity and trust in the individual researcher(s) and their research community.

Suppression of Alternative Hypotheses

When the focus of research is closely tied to commercialization outcomes, there can be an unintended suppression of alternative hypotheses that might not support the new venture or its business model (Harman, 2022). This conflict can result in confirmation bias, where researchers prioritize only experiments or interpretations that align with their business goals. A bias toward applied research at the expense of fundamental research, also has the potential to limit discoveries with broader and longer-term societal impact (Cho et al., 2000).

Influence of Venture Capitalists and Investors

Venture capitalists (VCs) or startup investors may exert additional pressure on researchers and institutions to produce research outcomes that align with their financial interests (MacDonald & Williams-Jones, 2009). This pressure can shift research toward developing technologies with market potential rather than exploring novel or risky academic questions. Investors may also influence the pace of research by demanding that specific results be prioritized, thereby undermining the objectivity of the scientific process.

Withholding Information from Employers or Funding Agencies

Faculty entrepreneurs may find themselves in situations where they must withhold research findings from their institution or research sponsoring agency due to commercial confidentiality agreements. This withholding of information could lead to ethical dilemmas related to transparency and communication with the scientific community.

Collaboration and Research Independence

Researchers involved in startups may favor their commercial interests when collaborating with other academic researchers or industry partners (Cho et al., 2000). These interests can skew the direction of joint research efforts, with a tendency to prioritize projects with potential commercial value, again aat the expense of more fundamental or exploratory scientific work. It can also exclude more diverse perspectives, thus diminishing the objectivity of research outputs and the openness and diversity of academic inquiry.

Funding for Sponsored Research

When researchers have ties to commercial ventures, conflicts can arise when seeking research funding. Funding agencies may question the objectivity of grant applications if the research is closely aligned with the goals of a startup. This bias can lead to concerns about selective reporting, funding allocation, and whether research outcomes are shaped by the interests of the commercial venture rather than advancing scientific inquiry.

Legal and Ethical Risks

Legal and ethical risks are also associated with commercialization activities. These include intellectual property disputes, patent infringement, and the misuse of research funds. Faculty members may inadvertently infringe on existing patents, mismanage the commercialization process, or fail to adequately disclose COIs, potentially leading to legal complications and ethical violations at the individual and institutional levels.

**Category 3: Mentoring and Advising Conflicts of Interest**

Technology commercialization and entrepreneurship activities at universities typically involve graduate students in the early stages of technology and venture development. These commercialization-related activities can interfere with traditional graduate student and faculty advisor relationships that focus primarily on research. Mentoring and advising issues that can lead to COIs that must be managed include the following:

Time Management

Faculty entrepreneurs, who are also responsible for advising graduate students, may dedicate more time to their startups and neglect their mentoring responsibilities (MacDonald & Williams-Jones, 2009). As a result, students may struggle to receive adequate guidance in their academic work, which can delay their progress or diminish the quality of their education. Since student time is considered a university resource, when more of their time is allocated to entrepreneurial ventures, it can blur the lines between academic and commercial activities.

Impact on Graduate Student Research

When a faculty member's commercial goals influence their research agenda, it can divert the focus from their graduate students' academic and career goals. Given their faculty advisors' interests, students may feel constrained to explore research topics outside a commercialization project's scope or may be discouraged from pursuing independent ideas that conflict with the startup's interests (MacDonald & Williams-Jones, 2009). This situation can result in students working on projects with limited academic merit or publication potential, thereby limiting their academic contributions and exposure.

Intellectual Property Disputes

When faculty and graduate students collaborate on research, questions may arise regarding the ownership of intellectual property developed (Harman, 2022). Faculty may claim ownership of

work produced by students, especially if it is relevant to the startup, leading to disputes, potential ethical violations, and legal costs.

Power Imbalance and Exploitation

Faculty entrepreneurs may exploit the inherent power imbalance in advisor-student relationships to prioritize their startup interests over their students' educational and professional development (MacDonald & Williams-Jones, 2009). For example, students might be pressured to work on projects that primarily benefit the faculty member's business (Harman, 2022). They may also be asked to perform tasks for the faculty's startup under the guise of academic work, potentially leading to unpaid or misclassified labor. Students may feel obligated to prioritize startup needs to maintain a positive relationship with their advisors and succeed in completing their doctoral education. This situation may be particularly true for certain subgroups of students, who are dependent on research funding and have few resources to resist unfair practices.

Dual Roles and Financial Interests

Graduate students may find themselves in the dual role of mentor-mentee and employer-employee (MacDonald & Williams-Jones, 2009). In addition to being students, they may also work for faculty startups as paid interns, employees, or equity owners. When faculty entrepreneurs employ graduate students in startup-related roles, conflicts may arise regarding compensation, workload, and expectations, especially when the startup cannot pay market rates. When faculty advise multiple students, this can also lead to skewed group dynamics and strained relationships between students who participate in entrepreneurship efforts and those who do not.

Impact on Publishing

A patent application is usually filed before any public disclosure of an invention. If a student's research is patentable, they may be required to delay publication to allow for the patent filing. Faculty may discourage students from presenting at conferences and publishing to protect a startup's intellectual property, which can delay a students' academic progress and career opportunities (Harman, 2022; MacDonald & Williams-Jones, 2009). A student may also be prevented from including methodological details required for reproducibility in any presentations or publications, as they could compromise a patent.

Delayed Graduation or Progress

Inevitably, entrepreneurship takes time away from conventional academic responsibilities, such as publishing, proposal writing, teaching, and training graduates. Students may experience delays in their academic progress if their research is driven by the unpredictable needs of the startup, particularly if technical or commercial pivots are required.

Competing for Advisor Attention

Students who are not involved in commercialization projects but part of a faculty member's research team may feel neglected or undervalued, leading to resentment and a breakdown in group dynamics. This may lead to students competing for their advisor's attention or resources, creating a divisive environment.

Conflicts in Evaluation and Progress

Faculty advisors periodically evaluate graduate student academic and research performance. Bias in assessing student performance can occur if faculty prioritize students' contributions to their startup over non-commercial activities. Higher-performing students may receive more favorable opportunities, such as funding or authorship, which can create inequities within a research group.

Legal and Institutional Policy Violations

Faculty members may fail to disclose COIs to the university, violating institutional policies. This can create risks for both faculty members and students if disputes arise. Employing graduate students in startup roles without proper contracts or compensation could lead to legal disputes and damage students' reputations.

Emotional and Psychological Stress

The dual demands of academic work and startup-related responsibilities can lead to burnout and stress for graduate students. In fear of retaliation, students may feel unable to express concerns or refuse participation in startup activities because they fear damaging their relationship with their advisers or harming their academic progress.

**Best Practices for Managing Conflicts of Interest**

Following the passing of the Bayh Dole Act, the extent to which universities actively managed entrepreneurial faculty varied considerably (Biancamano, 2001). Today, most public and private research universities have formal policies and practices for managing entrepreneurial faculty and COIs. These vary across institutions and are revised periodically based on factors such as the complexity of academic-industry relationships, regulations, public awareness, and faculty priorities and interests (Cho et al., 2000).

Policies and practices related to COIs are designed to promote ethical behavior, protect institutional integrity, and balance the dual goals of fostering innovation and maintaining academic values. However, the resources devoted to communicating and enforcing COIs can vary considerably across institutions (Cho et al., 2000). This is due to differences in levels of research activity, institutional funding, administrative capacity, and commitment to academic entrepreneurship. Larger, well-funded research universities typically have dedicated offices for technology transfer, business development, research compliance, and COI management, which facilitates clear communication of policies, periodic training, and rigorous enforcement of policies. Smaller or less-resourced universities are more likely to lack the required specialized staff, training, and monitoring.

Addressing COIs requires a multifaceted approach focusing on communication, education, prevention, evaluation, and enforcement. Typical channels for these activities include research administration offices, compliance administrators, or TTOs communicating with faculty, graduate students, and postdocs involved in protecting intellectual property or engaging in entrepreneurial activity. Some standard policies and practices are described below.

## Communication

To foster a culture of COI transparency and accountability, universities must actively communicate policies and procedures to internal and external stakeholders (Annane et al., 2019). Direct communication with and between faculty and students can increase trust and enhance compliance with disclosure requirements (Harman, 2022). Internally, COI policies should be communicated directly to faculty, students, and staff through face-to-face meetings, university websites, meetings, and workshops. Externally, universities should communicate with funding agencies, industry partners, and the public when COI issues are of concern. This is done through public statements outlining institutional policies and commitment to managing and enforcing COIs. If a COI issue arises that puts into question an institution's reputation, a crisis communication strategy should be implemented to address concerns.

## Education

Education related to COIs typically consists of comprehensive training programs that universities institute to increase awareness and develop competencies in recognizing and managing conflicts of interest (Annane et al., 2019). These target individuals at all levels including students, faculty members, and even external stakeholders. Most universities require faculty, students, and administrators engaged in research to complete online training modules that describe COIs and explain university policies, reporting requirements, and consequences of non-compliance. In addition, universities typically focus on COIs as part of new faculty and researcher orientations and departmental meetings. More specialized training can occur when faculty and students become involved in industry collaboration, technology commercialization, licensing, or startups.

## Prevention Measures

In addition to communication and education, other prevention measures are described below.

### *Conflict of Interest and Conflict of Commitment Disclosure Requirements*

At most universities, faculty and graduate students must submit annual detailed disclosures of financial interests, equity holdings, consulting agreements, and other entrepreneurial activities that could create COIs. Additional disclosures should be made as new activities arise, such as startup launches, obtaining industry funding, or filing new patents. Institutional administrators or pertinent committees, such as conflict of interest review boards, assess disclosures to identify and mitigate potential conflicts.

### *Time Allocation and Consulting Limits*

Many universities have policies on how much time faculty can dedicate to external consulting or entrepreneurial activities. Often, this is limited to one day per week. When faculty require more time to dedicate to their entrepreneurial activities, they can be encouraged to take formal leave or entrepreneurship-focused sabbaticals to engage in intensive startup work without conflicting with academic responsibilities. Institutions may conduct audits or require time logs to ensure compliance with time allocation policies.

*Use of University Resources Policies*

Given the potential overlap in research and entrepreneurial activities, university policies provide guidelines on the allowable use of university facilities, equipment, and personnel for commercial purposes. Resource use agreements typically outline arrangements between an institution and a startup. Faculty members must often pay fair market rates when using university resources in their entrepreneurial ventures. Maintaining clear boundaries between activities that are part of academic research and those used for commercial purposes is important.

*Intellectual Property Management*

TTOs manage intellectual property, provide commercialization support, and oversee licensing agreements in compliance and alignment with institutional goals. They typically have clear IP ownership policies, startup licensing agreements, and faculty and graduate student revenue-sharing agreements. Typically, TTOs collaborate with university research and compliance offices to manage COIs, monitor disclosure of entrepreneurial activities, and use of university resources for commercial activities.

*Research Integrity and Publication Policies*

Universities require faculty and students to disclose their ties to startups and industry partners when pursuing joint research or applying for funding. Collaborative agreements are reviewed to ensure they align with academic goals and have limited influence on research priorities. Timely publication of research results is expected when intellectual property is involved to preserve academic transparency and avoid delays due to commercial interests (Cho et al., 2000).

Evaluation and Enforcement

*Oversight and Enforcement Mechanisms*

Universities sometimes establish committees to evaluate disclosures, recommend management plans, and enforce compliance (Harman, 2022). Individual COI management plans are created to specify acceptable commercial activities, define boundaries, and outline reporting requirements.

*Disciplinary Measures*

Non-compliance with policies may result in disciplinary measures, including restrictions on entrepreneurial activities, revocation of access to university resources, or formal disciplinary actions.

*Graduate Student Protections*

When graduate students work for a faculty startup, universities often require formal employment agreements or contracts to prevent exploitation and ensure fair compensation. Institutional policies delineate the roles and responsibilities of graduate students involved in commercialization projects to ensure that their academic progress and career goals are prioritized. To avoid conflicts with faculty advisors, universities may assign “independent”

mentors or advisors to graduate students involved in entrepreneurial ventures to monitor their academic progress.

## Discussion

This paper describes COIs that occur when faculty and graduate students become involved in academic entrepreneurship. It is our experience that many faculty and graduate student researchers have limited awareness of the policies and practices universities put in place to protect their interests and those of the university. While this paper does not identify every type of COI that can occur, it describes fundamental conflicts that faculty and students should be aware of when they engage in entrepreneurial activities. It is clear from the following graduate student comments that generating awareness through education and communication is key:

> *Moving forward, I will pay more attention to ensuring clarity around intellectual contributions and the fair treatment of all parties in entrepreneurial and academic collaborations.*
>
> *From the beginning, faculty advisors and students need to define their working relationship, and the university's financial conflict of interest management plan provides a framework to ensure this essential communication happens.*
>
> *In the future, I will pay close attention to how conflicts of interest are managed in [student and facultys] teams, ensuring that my academic progress is never compromised due to my involvement in business activities. Transparency, oversight, and the recognition of students' contributions are essential aspects that should always be handled carefully to avoid ethical dilemmas.*
>
> *I will have to pay attention that there is not major conflicts regarding mixed entrepreneurial teams and that there is appropriate respect between the faculty and student. It can be hard for a student to fight with the faculty funding them, but that is an important conflict to consider!*

Significant costs are associated with fostering an entrepreneurial culture and maintaining academic integrity, institutional priorities, student and stakeholder interests, and legal compliance. Also, it is important to balance compliance with policies that are not perceived as hostile to entrepreneurship (Renault, 2006). Managing COIs and conflicts of commitment in this area can present significant ethical and practical challenges. Ethically, universities must balance public and private interests, ensuring that entrepreneurial activities do not undermine their mission of advancing knowledge for the greater good. Practically, universities face difficulties in defining clear policies, monitoring faculty activities, and preventing the misuse of institutional resources. These challenges are compounded by complexities in managing industry relationships, ensuring compliance with regulations, and addressing disputes over intellectual property ownership.

Universities and society can significantly benefit from creating and encouraging entrepreneurial ecosystems that bridge the gap between academic research and commercial ventures and allow faculty, researchers, and graduate students to realize personal and financial benefits from their research. Technology commercialization and founding startups present an opportunity to create

jobs and contribute to economic development. It is also a way for universities to increase prestige, attract top faculty, and increase university-industry partnerships. Despite questions about whether these activities increase revenue for the university or are financially viable, academic leaders consider technology transfer activity an important aspect of a university's regional and national impact.

To meet these objectives, universities must establish robust policies, provide regular training, enforce transparent disclosure processes, and create a culture that balances entrepreneurial innovation with academic integrity. Most importantly, faculty and administrators must comply with them.

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