

The "Human Capital" Report

RESPONSE TO VIRGINIA ACTS OF ASSEMBLY (2004) CHAPTER 537

February 3, 2005





COMMONWEALTH of VIRGINIA

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The Honorable Mark R. Warner
Governor of Virginia

Delegate Joe T. May (Patron, 2004 HB 547)
Virginia House of Delegates

Members of the General Assembly of Virginia

The State Council of Higher Education for Virginia (SCHEV) is pleased to submit the attached report, *Response to Virginia Acts of Assembly (2004) Chapter 537: The "Human Capital" Report*. This study was required by legislation that Del. May introduced as House Bill 547 last year.

§ 1. The State Council of Higher Education for Virginia (SCHEV) shall develop policies to eliminate the barriers between the Commonwealth's institutions of higher education and industry and enhance the development of human capital in the Commonwealth. These policies and strategies shall include a review of (i) offering incentives for industry to partner with universities in the practical training of undergraduate and graduate students; (ii) providing opportunities and incentives for corporate scientists and engineers to have adjunct appointments at universities to train and collaborate with faculty and students; (iii) assisting universities in acquiring funding to build or buy facilities where academic labs and corporate entities can work together; (iv) providing opportunities and assistance for academic researchers to take one- to two-year sabbaticals in a corporate setting or national lab and bring that experience back to the institution; (v) increasing the two-year leave of absence for science and engineering faculty to generate more industrial-sponsored research; (vi) allowing industry to fully fund faculty salaries and allow the faculty to work in industry while remaining a university employee, with proper safeguards in place; and (vii) allowing faculty to be part-time university employees and part-time industry employees, also with proper safeguards in place.

The State Council of Higher Education for Virginia (SCHEV) shall report its findings to the Governor and the General Assembly by November 30, 2004.

§ 2. All agencies of the Commonwealth shall provide assistance to SCHEV, for the development of these policies and strategies, upon request.

An outline of this report was approved by the State Council at its October 19, 2004, meeting, and this final version was approved as a SCHEV issue brief by Council chair Alan Wurtzel and Council's Academic Affairs Committee chair Christine Milliken.

SCHEV is pleased to contribute to advancing the understanding of the emerging issues of higher education-industry collaboration and human-capital development in Virginia. If you have questions or need additional information, please contact me or the staff member who led this study, Alan Edwards (804.225.3189; alanedwards@schev.edu).

Sincerely,

Daniel J. LaVista
Executive Director

Enclosure

c: The Honorable Belle S. Wheelan, Secretary of Education

PREFACE

Chapter 537 of the 2004 Virginia Acts of Assembly stipulates that:

The State Council of Higher Education for Virginia (SCHEV) shall develop policies to eliminate the barriers between the Commonwealth's institutions of higher education and industry and enhance the development of human capital in the Commonwealth. These policies and strategies shall include a review of (i) offering incentives for industry to partner with universities in the practical training of undergraduate and graduate students; (ii) providing opportunities and incentives for corporate scientists and engineers to have adjunct appointments at universities to train and collaborate with faculty and students; (iii) assisting universities in acquiring funding to build or buy facilities where academic labs and corporate entities can work together; (iv) providing opportunities and assistance for academic researchers to take one- to two-year sabbaticals in a corporate setting or national lab and bring that experience back to the institution; (v) increasing the two-year leave of absence for science and engineering faculty to generate more industrial-sponsored research; (vi) allowing industry to fully fund faculty salaries and allow the faculty to work in industry while remaining a university employee, with proper safeguards in place; and (vii) allowing faculty to be part-time university employees and part-time industry employees, also with proper safeguards in place.

Toward this end, the staff of SCHEV's Academic Affairs and Planning section initiated this research project in the summer of 2004, led by senior associate Alan Edwards with the assistance of a Governor's Fellow, Mary Warder, in the Office of the Secretary of Education. The State Council would like to acknowledge the many individuals from higher education and industry who provided input for this report:

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A draft outline of this document was approved by the State Council at its October, 19, 2004, meeting, and the final report was approved by Council chair Alan Wurtzel, Council’s Academic Affairs Committee chair Christine Milliken and SCHEV executive director Daniel LaVista.

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EXECUTIVE SUMMARY

OVERVIEW

Recognizing the history, recent trends and potential benefits of interactions and research collaborations between higher education and industry, Chapter 537 of the 2004 Virginia Acts of Assembly directs the State Council of Higher Education for Virginia (SCHEV) to work toward eliminating the barriers between the Commonwealth’s institutions of higher education and industry by enhancing the development of human capital in Virginia. These efforts are to include attention to university-industry partnership incentives, shared facilities and labs, and various means of facilitating and rewarding the sharing of personnel across university and industry borders.

This report represents the State Council’s response to Chapter 537 and has been developed following conversations with key constituents and stakeholders in Virginia higher education and industry, as well as from review of relevant state and national reports. Beyond addressing the seven specific barriers from its enacting legislation, this report identifies multiple additional barriers—overarching barriers that SCHEV believes must also be addressed by the General Assembly, the State Council, the public colleges and universities, and their current and future corporate partners before real progress can be made toward increasing sponsored research, higher education-industry collaboration, and human-capital development in the Commonwealth.

ISSUES, FINDINGS AND RECOMMENDATIONS

Some of the most fundamental obstacles to university-industry collaborations arise from higher education and business being so different; they have very different missions and goals, as well as very different—sometimes conflicting—organizational and administrative cultures, structures and processes for accomplishing their missions and goals. To overcome these differences, higher-education institutions and corporations must strive to ensure that their collaborations pair campus expertise with company interests and that their results are ethical, publishable, and “applied” enough to satisfy corporate investors. When a university-industry collaboration is successful, the likelihood of one or more future collaborations between the partners is increased.

Other obstacles and barriers are beyond the control of corporations and public colleges/universities, such as laws and policies that govern all public entities. Discussions in previous state and national reports have focused on specific issues at the people or organizational levels, while tending to overlook or discount many of the broader, more overarching issues discussed in this issue brief. This SCHEV report concludes that, in order to achieve Chapter 537’s goals of eliminating the barriers between Virginia’s institutions of higher education and industry and enhancing the development of human capital in the Commonwealth, multiples strategies—from the state level to the faculty level—must be employed. Taken together, the strategies recommended below form a roadmap for academic research in the Commonwealth and include actions that will be taken by the State Council as well as those that SCHEV believes should be taken by the General Assembly, potential corporate partners, and Virginia’s public colleges and universities.

What SCHEV Will Do. SCHEV will distribute this report’s findings, conclusions and strategies to its various constituencies, including its institutional advisory groups, and will urge them to consider the various strategies and recommendations offered herein for addressing the multiple barriers to higher education-industry collaboration.

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Specifically, the State Council of Higher Education for Virginia—within the context of its ongoing activities, its budgetary/staffing limitations and its current statutory responsibilities*—will:

- (1) convene a working group of research administrators to develop administration and management structures and charge this group with producing a set of specific recommendations for enhancing higher education-industry research collaboration;
- (2) provide information and data to Virginia’s public colleges and universities to inform their deliberations about new innovations in human capital (e.g., faculty/industry researcher employment arrangements);
- (3) locate and disseminate relevant research and policy documents from state, regional and/or academic higher-education entities; and
- (4) assist Virginia’s institutions of higher education in identifying exemplary practices and/or models of incentivizing industry partnerships, sharing facilities and labs with corporate partners, and facilitating personnel sharing across campus-industry borders.

What Else Should Be Done.

RECOMMENDATION 1: The General Assembly should grant—to an existing or a new state entity—the authority, funding and staff to coordinate and facilitate the academic research of Virginia’s public colleges and universities, including the responsibility to address the various statute/policy-level, organization/institution-level and culture/people-level barriers to collaboration between industry and higher education detailed in this and previous reports.

RECOMMENDATION 2: The General Assembly should charge the state entity in Recommendation #1 with convening a task force of representatives from state government, higher education and industry to begin to address statutory and/or state-policy barriers to campus-corporation research collaboration, including Virginia’s conflict-of-laws statute and its requirements regarding arbitration, indemnification, intellectual property and state-employee salaries and benefits.

RECOMMENDATION 3: The state entity in Recommendation #1 should:

- a. assist colleges, universities and corporations—perhaps via multiple regional entities—in identifying Virginia faculty, students and industry researchers who are interested in higher education-industry collaborations (via means such as faculty sabbaticals, extended leaves of absence, industry-researcher adjunct appointments and student internships), and in disseminating this information regionally and/or state-wide;
- b. facilitate the establishment of inter-institutional partnerships with industry, including strategic collaborations with other states and countries; and
- c. develop a plan to fund all recommendations that follow below.

RECOMMENDATION 4: Virginia’s public colleges and universities should:

- a. ensure that their faculty hiring, promotion and tenure policies/processes address issues of collaboration with industry; and
- b. share these policies/processes, as well as those regarding benefits, sabbaticals/leaves of absence and adjunct appointments, with one another.

* § 23-9.6:1(2) of the Code of Virginia precludes the State Council of Higher Education from affecting “either directly or indirectly, the selection of faculty,” which “shall remain a function of the individual institutions.”

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RECOMMENDATION 5: Corporate partners, in their research collaborations with Virginia’s public colleges and universities, should:

- a. provide guarantees that they will fund adjunct replacements for collaborating full-time faculty; and
- b. compensate institutions fairly for the opportunity costs associated with their loss of agility in personnel matters (i.e., from extended faculty leaves of absence).

RECOMMENDATION 6: Virginia’s public colleges and universities should:

- a. establish and maintain effective institutional offices (e.g., Technology Transfer; Corporate Relations) to support collaborations with industry, to communicate and manage expectations and to scout future potential opportunities; and
- b. strengthen the coordination between and across these support offices, including co-location of some offices or functions.

RECOMMENDATION 7: Public colleges and universities should:

- a. cultivate institutional “champions” for collaborations with industry;
- b. establish a cooperative tone toward industry collaborations from the top of the institutions down; and
- c. align their incentive policies and processes to encourage cross-campus teamwork and to promote collaborations with industry.

RECOMMENDATION 8: The state entity in Recommendation #1 should:

- a. identify exemplary sections from model contracts/agreements that reduce or eliminate barriers to university-industry collaborations; and
- b. disseminate these models/sections to Virginia’s public colleges and universities.

RECOMMENDATION 9: Virginia’s public colleges and universities should:

- a. ensure that their patent, copyright and licensing policies comply with recent state and federal legislation; and
- b. consider structuring their policies to enhance industry collaboration and to facilitate intellectual-property commercialization.

RECOMMENDATION 10: Neither the Commonwealth of Virginia nor its public colleges and universities should view industry funding as an appropriate substitute for adequate, long-term public financing of basic academic research.

**CHAPTER 1:
BARRIERS TO HIGHER EDUCATION-INDUSTRY COLLABORATIONS**

DOCUMENT OVERVIEW

Recognizing the history, recent trends and potential benefits of interactions and research collaborations between higher education and industry, Chapter 537 of the 2004 Virginia Acts of Assembly directs the State Council of Higher Education for Virginia (SCHEV) to work toward eliminating the barriers between the Commonwealth’s institutions of higher education and industry by enhancing the development of human capital in Virginia. These efforts are to include attention to university-industry partnership incentives, shared facilities and labs, and various means of facilitating and rewarding the sharing of personnel across university and industry borders.

This report represents the State Council’s response to Chapter 537 and has been developed following conversations with key constituents and stakeholders in Virginia higher education and industry (see Preface), as well as from review of relevant state and national reports. Beyond addressing the seven specific barriers from its enacting legislation, this report identifies multiple additional barriers—overarching barriers that SCHEV believes must also be addressed by the General Assembly, the State Council, the public colleges and universities, and their current and future corporate partners before real progress can be made toward increasing sponsored research, higher education-industry collaboration, and human-capital development in the Commonwealth.

This chapter identifies and discusses selected barriers to, and specific problems inherent within, high education-industry interaction and collaboration; various personnel- and institution-level strategies for addressing these barriers are also provided. Reflecting ideas and suggestions gleaned from academe, industry, government and national research, Chapter 2 offers broad as well as specific conclusions and recommendations for overcoming or eliminating these barriers in Virginia. The Appendix provides the language of Chapter 537.

CHAPTER OVERVIEW

In this chapter, various real or perceived barriers to higher education-industry collaborations are detailed; these higher-level barriers often precipitate the seven personnel- and facilities-level barriers identified in Chapter 537. The “Overarching Issues” section presents some of the broad, often intangible and/or perceptual college/university, government and industry issues that should be considered prior to the establishment of a college/university-industry collaboration. The “Specific Issues” section discusses two relevant barriers—state law/policy issues and intellectual-property issues—that often arise both prior to and within such collaborations.

OVERARCHING ISSUES

Many significant, overarching issues must be considered either in advance of or in conjunction with attempts at higher education-industry collaboration. On the university side, these major issues include fundamental concerns about academic freedom, specific concerns about effects on faculty and students, and strategic concerns about potential impacts on their missions, reputations and financing, as well as on the expectations and perceptions of public officials. On the government side, the significant issues can include overzealous, as well as over-cautious, state officials. On the corporate side, the overarching issues that can hinder or prevent collaborative work with higher education include biases against

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academic work, perceptions that campus research projects are difficult to incorporate into product-development processes, and the absence or withholding of management support within corporations.

Overarching University Issues. Whether a joint research project with a corporate partner fits with the core mission of a publicly-funded and publicly-focused college or university is a basic, fundamental, if not philosophical issue. The proprietary nature of the work and results of some such collaborations is sometimes viewed as running counter to academia’s traditional ideal—an atmosphere of free and open inquiry. Concerns are sometimes expressed that campuses’ involvements in industry research collaborations may unduly influence faculty members’ *academic freedom*, as well as *promotion and tenure decisions*. University researchers’ acquisition of equity in companies supporting their research can damage individual *faculty members’ reputations* as independent and unbiased truth-seekers and can call into question *faculty members’ professional commitments* to protect the well-being of their institutions and students. Faculty—and students—can face internal and/or external pressures to undertake research topics that reflect the priorities of corporate sponsors rather than their best interests.¹

Involvement in collaborations with industry can significantly hinder *graduate and undergraduate students’ academic work and schedules* by involving them inappropriately in confidential research or imposing publication restrictions on them. To complete their Ph.D.s, graduate students involved in industry-sponsored projects often take six months longer than is generally the case in purely academic research efforts, and on rare occasions, doctoral candidates find that their thesis research is not publishable at all because it is wrapped in corporate secrecy constraints.²

Through collaborations with colleges and universities, companies have long sought to meet and hire researchers—current students, new graduates and even faculty themselves. Concerns over the possibility of *losing students and research faculty* to corporate partners as a result of collaborations can make institutions much less inclined to enter into such arrangements. Moreover, the hiring of students by faculty-owned companies can significantly blur the distinction between student and employee.³

Additionally, collaborations with, and/or research funding from, industry can carry numerous *financial risks* for institutions of higher education. Public colleges and universities may be hesitant to enter into such collaborations if they perceive a possibility that, if they are successful in attracting significant industry funding for research, then the state may reduce their public funding and/or pressure them to shift internal resources to support industry work. Such cost shifting can have significant effects on the financial and organizational structures of colleges and universities. Conversely, the potential financial opportunities of research collaborations with industry can entice institutions to allocate so much of their internal resources to attracting and managing such collaborations that they insufficiently fund other academic units.

Potential *risks to the tax-exempt status* of non-profit colleges and universities can also be major issues. Although university research is specifically excluded from the unrelated business income tax (UBIT), the income derived from a regular trade or business that is not substantially related to an institution’s tax-exempt function is not excluded from UBIT; neither is product testing.⁴ Prior to and during

¹ Rosenzweig, Robert. “Universities Change, Core Values Should Not,” *Issues in Science and Technology* (Winter 1999).

² ACE Business-Higher Education Forum. *Working Together, Creating Knowledge*. (Washington DC: American Council on Education, 2001), p. 28.

³ *Overcoming Barriers to Collaborative Research: Report of a Workshop*, Government-University-Industry Research Roundtable (Irvine, CA: National Academy Press, 1999), p. 10.

⁴ *Proceedings of A Dialog on University Stewardship: New Responsibilities and Opportunities*, Government-University-Industry Roundtable (National Academy Press, 1999).

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collaborations with corporate partners, colleges and universities must also be mindful of certain *restrictions on the use of buildings and equipment financed by tax-exempt bonds*.

For colleges and universities, collaborations with industry also carry potential *risks to institutions’ public perceptions and reputations*. For example, campus research units that attract substantial corporate sponsored-research revenue may appear to outsiders to be eluding the supervision and evaluation of centralized administration or faculty. If corporate interests are perceived to be shaping the budgets of public colleges and universities, to whatever extent, then these institutions run the risk of losing some of the public’s confidence in them, if not some of their institutional independence.

Overarching State-Government Issues. State governments can impact collaborations between higher education and industry. As elected and appointed officials across the U.S. have become increasingly interested in using academic research, as well as community colleges, to help spur *regional and/or statewide economic growth*, many have warmed to the prospects and potentials of campus-company collaborations. However, when such officials are not familiar with the academic research process or the seminal role of individual faculty members in selecting research targets, their attempts to spur such collaborations—which the institutions may view as inappropriate, premature or overzealous—can prompt resistance on the campus side and render current and future collaborations even more difficult.⁵

Conversely, in some states, officials have expressed suspicions of universities’ industry ties and have tried to restrain research collaborations to prevent them from becoming—or appearing to become—corporate giveaways. A few state legislatures have made it very difficult for public colleges and universities to transfer technology due to concerns that they would be vulnerable to charges of *using state funds to enrich the private sector*.⁶

Overarching Industry Issues. At a basic level, the establishment of a productive collaboration requires that potential partners understand and appreciate the value that each side can bring to the relationship. Corporate officials, however, sometimes *may not see academia as a source of relevant ideas*. Some executives have stated publicly their belief that the most valuable insights are gained through direct, “real-world” experience in specific areas of application (i.e., in business) rather than in “detached” academe.⁷

Others *appear to be biased against collaborations* with higher education. In national reports, some corporate executives, accustomed to operating independently, report viewing college/university research as an expense without a return. For some companies, particularly small and medium-sized ones, the *necessary tools, processes, personnel and funds* to make collaborations of much magnitude and/or complexity work effectively can be lacking. As a result, research collaborations with colleges and universities usually require *internal champions* to rally support within both small and large companies.⁸

Internal competition among or isolation between different parts of a company can also work against research collaborations with colleges and universities. A culture of “warring tribes,”⁹ or simply research *scientists’ and managers’ preferences to work alone*,¹⁰ can make it very difficult for a company to collaborate successfully—either internally or externally.

⁵ *A Dialog on University Stewardship: New Responsibilities and Opportunities*.

⁶ *Ibid.*

⁷ *Working Together, Creating Knowledge*, pp. 29-30.

⁸ *Ibid.*, p. 30.

⁹ Allen, Gene and Jarman, Rick. *Collaborative R&D: Manufacturing’s New Tool* (New York: John Wiley and Sons), p. 10.

¹⁰ Guschl, Randolph. “Technology Transfer: Too Many Options?,” *Chemtech* (July 1997), p. 8.

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Keeping internal research relevant to business needs is difficult enough for corporations; this challenge is magnified in collaborations with higher-education partners due to the common *perception that colleges and universities lack both direct experience in keeping research relevant to specific goals and direct incentives to do so.*¹¹ When the integration of outside (academic) research results into companies’ product development processes is complicated or prevented, their perceptions of the utility of such external collaborations can be reduced greatly.

Generally, the *level of corporate management support* for research collaborations is related to factors such as cost, time to complete, and risk of losing control of proprietary information. Other management barriers include lack of understanding of how universities operate, inability or unwillingness to appreciate the different time horizons of the two sectors, and incompatible institutional reward structures for researchers who participate in collaborations. Frequent turnover of industrial program managers, whether because of merger activity or company promotions and reassignments, also can be a problem in long-term collaborations. And in some cases, companies may require assistance in navigating the internal bureaucracy of a college or university partner.¹²

SPECIFIC BARRIERS

Among the potential practical barriers to interactions and collaborations between higher education and industry are the differing time horizons of the two sectors, ongoing inability or failures to completely understand how the other side operates, and myriad institutional reward structures that may or may not consider or account for individuals’ participation in collaborations.¹³ Albeit with decreasing frequency, some universities and corporations are still not organized in ways that foster collaborations; some continue to lack structures responsible for finding compatible collaboration partners, managing collaborations, and/or coordinating support services. Finally, some officials and researchers on both sides remain skeptical of the idea that collaborations with the other side should be permanent additions to their organizations’ menus of research options.¹⁴

Two additional issues—those of Virginia state laws/policies and intellectual property—are directly related to the goals of Chapter 537 and represent additional potential barriers to the successful establishment and accomplishment of higher education-industry research collaborations. These potential barriers are discussed in detail below; general strategies for reducing or eliminating them are included.

State-Law/Policy Issues. In Virginia, various laws and policies pertaining to public bodies often make potential corporate partners hesitant or leery of entering into university-industry collaborations. For example, the conflict-of-laws statute and the (non-) arbitration laws combine to require that all disputes involving Virginia’s public college and universities, and the contracts into which these institutions enter, must be addressed in the Commonwealth’s courts. Given that court proceedings can be expensive and damaging to public images and reputations, these laws often function to inhibit industry’s willingness to form collaborative relationships with public higher education. Virginia’s policies regarding indemnification also prohibit public colleges and universities from indemnifying their corporate partners, leaving these industry collaborators open to lawsuits.

¹¹ *Overcoming Barriers to Collaborative Research: Report of a Workshop*, pp. 8-9.

¹² *Working Together, Creating Knowledge*, p.30.

¹³ *Overcoming Barriers to Collaborative Research: Report of a Workshop*, pp. 8-9.

¹⁴ Tornatzky, Louis, Waugaman, Paul and Gray, Dennis. *Industry-University Technology Transfer: Models of Alternative Practice, Policy, and Program* (August 1999), p. 9.

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While the Commonwealth’s laws and policies are understandable and justifiable for protecting state and the public interests, these mandates can hinder collaboration between higher education and industry. One strategy for addressing these obstacles is for the Commonwealth to review these laws and policies with an eye toward amendments or exemptions for public colleges and universities in their contracts and disputes with corporate partners. The public institutions of higher education can also strive to work with industry to reduce or overcome the potential negative impacts of these laws and policies on corporate partners in university-industry collaborations.

Intellectual-Property Issues: Some of the biggest barriers to university-industry collaboration are issues related to the ownership, value and use of the intellectual property that may arise from joint efforts. Generally, each side desires to own or have access to any future intellectual property that results from their collaboration. When federal funding is involved, the federal Bayh-Dole Act¹⁵ vests the ownership of intellectual property with universities rather than with any corporate participants. When no federal funds are involved, issues of intellectual-property ownership, value and use are more complex and tend to manifest themselves either in patent or copyright (ownership) issues or in licensing (use) issues.

Most intellectual-property issues in university-industry collaborations are addressed via patents, and patent law tends to be sharply defined. However, when such collaborations involve educational materials, copyrights are the predominant mechanism for resolving ownership issues; copyright law tends to be much more ambiguous. The ownership relationship between universities and their faculties is very different in patent and copyright cases, and this difference can have significant implications for universities’ negotiations of intellectual property use agreements with industrial sponsors. Specifically, faculty members usually control the copyright on their course materials, and as a result, universities are not free to license the materials to industrial sponsors, as they are free to do with patents.

Because the financial stakes are often high, many negotiations between universities and industry partners are conducted as if each side may yield the next “blockbuster” patent. But patents with such broad applications and high values are uncommon, and their use still does not encompass the substantial downstream costs and risks of developing and marketing actual products. As a result of these expectations and countering realities, university-industry negotiations for research partnerships can be quite arduous when combined with contentious licensing negotiations.¹⁶

Regarding patents, key strategies for universities and industrial partners include remaining both flexible and focused on long-term goals during negotiations of intellectual property rights and related issues. Regarding copyrights, a key strategy is for universities to update their copyright policies to clarify how such matters will be handled in collaborative agreements with corporate partners. Regarding licensing terms, key strategies for collaboration partners include resolving commercialization terms quickly or deferring royalty-rate negotiations until the research is complete.¹⁷

¹⁵ From the passage of the Morrill Land-Grant Act of 1862 through the 1970s, each of the federal agencies involved in sponsored academic research maintained separate and distinct policies regarding patent ownership and licensing of this research. The Bayh-Dole Act of 1980 was passed to eliminate such impediments. The legislation set a uniform federal invention policy; it also permitted colleges and universities to retain ownership of patents generated through federally-funded research and encouraged institutions of higher education to work with industry to commercialize campuses’ inventions.

¹⁶ *Working Together, Creating Knowledge*, p.57.

¹⁷ *Ibid*, p. 60.

CHAPTER 2: CONCLUSIONS AND RECOMMENDATIONS

OVERVIEW

Some of the most fundamental obstacles to university-industry collaborations arise from higher education and business being so different; they have very different missions and goals, as well as very different—sometimes conflicting—organizational and administrative cultures, structures and processes for accomplishing their missions and goals. To overcome these differences, higher-education institutions and corporations must strive to ensure that their collaborations pair campus expertise with company interests and that their results are ethical, publishable, and “applied” enough to satisfy corporate investors. When a university-industry collaboration is successful, the likelihood of one or more future collaborations between the partners is increased.

Other obstacles and barriers are beyond the control of corporations and public colleges/universities, such as laws and policies that govern all public entities. Discussions in previous state and national reports and studies have focused on specific issues at the people or organizational levels, while tending to overlook or discount many of the broader, more overarching issues discussed in this issue brief. This SCHEV report concludes that, in order to achieve Chapter 537’s goals of eliminating the barriers between Virginia’s institutions of higher education and industry and enhancing the development of human capital in the Commonwealth, multiples strategies—from the state level to the faculty level—must be employed. Taken together, the strategies recommended below form a roadmap for academic research in the Commonwealth and include actions to be taken by the General Assembly, the State Council, potential corporate partners, and Virginia’s public colleges and universities.

A RESEARCH ROADMAP FOR THE COMMONWEALTH

As evidenced in the goals and priorities of Governor Mark Warner and the ongoing work of state entities such as SCHEV, VRTAC and Virginia’s Center for Innovative Technology (CIT), the Commonwealth is committed to strengthening and promoting sponsored research in Virginia via multiple means, including higher education-industry collaborations. In fact, the components of Chapter 537 evolved from the efforts of VRTAC and CIT. The State Council believes that, as one aspect of its response to Chapter 537, this report sharpens the issues surrounding higher education-industry collaborations and offers both broad and specific strategies and recommendations for addressing the issues and barriers identified in this and previous reports.

Filling the Void. The Commonwealth supports 15 strong, diverse public four-year colleges and universities, six of which are classified as “Doctoral/Research” institutions by the Carnegie Foundation for the Advancement of Teaching. Comparatively, of the 20 states with 13 or more public four-year institutions, Virginia is second only to Michigan in terms of its percentage of such institutions classified as “Doctoral/Research.” And yet, no single Virginia entity is currently authorized to coordinate and facilitate academic research. During the past two legislative budget cycles, the State Council has sought but failed to receive authorization or resources to administer such functions. Because of SCHEV’s lack of resources and research expertise to lead academic-research initiatives, the language of 2004’s HB 547 was changed to assign the study of the potential need for a major research institution or center(s) in the Northern Virginia and Hampton Roads regions from SCHEV to VRTAC. VRTAC found it necessary to request a deadline extension for the report of that study, as did SCHEV with this report.

In order to fully address the research goals of the Governor, Chapter 537, and the Commonwealth, a single Virginia entity should be granted authority, funds and staff to not only facilitate and coordinate

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academic research but also to develop the specific policies sought in Chapter 537 for overcoming and/or eliminating the barriers to collaboration between industry and Virginia’s public institutions of higher education.

RECOMMENDATION 1: The General Assembly should grant—to an existing or a new state entity—the authority, funding and staff to coordinate and facilitate the academic research of Virginia’s public colleges and universities, including the responsibility to address the various statute/policy-level, organization/institution-level and culture/people-level barriers to collaboration between industry and higher education detailed in this and previous reports.

RECOMMENDATION 2: The General Assembly should charge the state entity in Recommendation #1 with convening a task force of representatives from state government, higher education and industry to begin to address statutory and/or state-policy barriers to campus-corporation research collaboration, including Virginia’s conflict-of-laws statute and its requirements regarding arbitration, indemnification, intellectual property and state-employee salaries and benefits.¹⁸

In the Meantime. SCHEV will distribute this report’s findings, conclusions and strategies to its various constituencies, including its institutional advisory groups, and will urge them to consider the various strategies and recommendations offered herein for addressing the multiple barriers to higher education-industry collaboration.

Specifically, the State Council of Higher Education for Virginia—within the context of its ongoing activities, its budgetary/staffing limitations and its current statutory responsibilities¹⁹—will:

- (1) convene a working group of research administrators to develop administration and management structures and charge this group with producing a set of specific recommendations for enhancing higher education-industry research collaboration;
- (2) provide information and data to Virginia’s public colleges and universities to inform their deliberations about new innovations in human capital (e.g., faculty/industry researcher employment arrangements);
- (3) locate and disseminate relevant research and policy documents from state, regional and/or academic higher-education entities; and
- (4) assist Virginia’s institutions of higher education in identifying exemplary practices and/or models of incentivizing industry partnerships, sharing facilities and labs with corporate partners, and facilitating personnel sharing across campus-industry borders.

¹⁸ Regarding the salary and benefits of public institutions’ faculties, in order for a faculty member to continue to receive full state benefits while working in industry (on leave/sabbatical/temporary joint appointment) and less than full-time on campus, the Commonwealth requires that he/she be paid for full-time work by one of the parties, usually the college/university. The other employer must then supply a grant to subsidize its portion of the researcher’s salary. Some colleges and universities may be reluctant to allow their faculty members’ salaries to be paid in part or in total by industry; they may also be reluctant to pay 100% of the salaries of researchers who do not work on campus full-time. Moreover, when a faculty researcher is co-hired by a campus and a company, often neither employer is willing to provide full-time employee benefits. Negotiation and administration of these arrangements can be additional barriers to higher education-industry collaboration in Virginia.

¹⁹ § 23-9.6:1(2) of the Code of Virginia precludes the State Council of Higher Education from affecting “either directly or indirectly, the selection of faculty,” which “shall remain a function of the individual institutions.”

Addressing Faculty Issues. Above all, the success of Virginia’s public colleges and universities in their research collaborations with industry partners and sponsors is dependent upon the level of interest and enthusiasm that their faculty scientists and researchers bring to such joint research efforts. Therefore, Virginia’s public colleges and universities, as well as the Commonwealth itself, should encourage faculty members’ abilities to develop corporate partnerships in ad hoc and informal ways. At the same time, motivating and helping faculty members to locate potential collaboration partners requires that their institutions and the state (i.e., the entity in Recommendation #1) possess sophisticated understandings of not only how researchers operate, but also of individual researchers’ focus areas, of institutions’ strengths and research niches, and of how these focus areas and research niches match with the specific interests of potential corporate partners across the Commonwealth and beyond.

Usually, the faculty members who pursue collaborative projects with industry are interested in both the fundamental science of their disciplines and how to use that new knowledge; they also tend to be skilled at the networking and relationship-building necessary to find potential partners. However, at some colleges and universities, the number of faculty interested in and willing to collaborate with corporate partners is relatively small. Moreover, those who are the most effective at collaborating tend to also be the ones who are the most oversubscribed. These faculty “supply” realities can be significant limiting factors for institutions seeking industry collaborations, and vice versa.

Therefore, as research projects increasingly require specialized expertise and/or interdisciplinary understanding beyond that usually found on a single campus or in the skill set of the limited supply of faculty interested in industry collaboration, the Commonwealth should be assisting its public colleges and universities in identifying and engaging multiple interested participants, not only internally but also externally—across disciplines/fields, institutions, corporations, geographic regions, and even state borders. As a result, SCHEV offers the following recommendation:

RECOMMENDATION 3: The state entity in Recommendation #1 should:

- a. assist colleges, universities and corporations—perhaps via multiple regional entities—in identifying Virginia faculty, students and industry researchers who are interested in higher education-industry collaborations (via means such as faculty sabbaticals, extended leaves of absence, industry-researcher adjunct appointments and student internships), and in disseminating this information regionally and/or state-wide;**
- b. facilitate the establishment of inter-institutional partnerships with industry, including strategic collaborations with other states and countries; and**
- c. develop a plan to fund all recommendations that follow below.**

At the same time, Virginia’s public colleges and universities indicate that their willingness to enter into collaborations with industry would be heightened by assistance from the state and/or potential corporate partners in addressing issues of faculty time, pay and benefits. For example, when faculty members are on sabbaticals, locating adjuncts and securing funds from which to pay them can become major problems for public institutions. The Commonwealth requires that, in order for a faculty member to work part-time on campus and part-time in industry and still receive full state benefits, the faculty member must be paid for full-time work by one of the parties. The other party must then supply a grant to subsidize a portion of the researcher’s salary. Also, this study found little institutional support for Chapter 537’s goal of increasing the two-year leave of absence for science and engineering faculty. According to Virginia’s public colleges and universities, increasing these leaves of absence beyond two years could unduly restrict their abilities to redistribute or eliminate faculty positions in a timely manner when such

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redistributions/eliminations would be warranted responses to changes in these institutions’ enrollments or external environments.

Going forward, the colleges and universities that will be most successful in attracting and conducting collaborations with industry will be those that: (1) hire new faculty who are open to such collaborations; and/or (2) can generate and sustain the interest of those current faculty who have not yet collaborated extensively with industry.²⁰ To assist Virginia’s public colleges and universities with these efforts, SCHEV offers the following recommendations:

RECOMMENDATION 4: Virginia’s public colleges and universities should:

- a. ensure that their faculty hiring, promotion and tenure policies/processes address issues of collaboration with industry; and
- b. share these policies/processes, as well as those regarding benefits, sabbaticals/leaves of absence and adjunct appointments, with one another.

RECOMMENDATION 5: Corporate partners, in their research collaborations with Virginia’s public colleges and universities, should:

- a. provide guarantees that they will fund adjunct replacements for collaborating full-time faculty; and
- b. compensate institutions fairly for the opportunity costs associated with their loss of agility in personnel matters (i.e., from extended faculty leaves of absence).

Addressing Institutional Issues. For Virginia’s public colleges and universities to attract, negotiate and conduct successful research collaborations with industry partners and sponsors, they must provide organizational support for ensuring that the various administrative structures on campus work together effectively and efficiently. The institutions of higher education that are most successful in attracting, negotiating and conducting collaborative efforts with corporate partners appear to be successful not only in creating specific units dedicated to such efforts, but also at structuring and/or restructuring themselves for success.

The administrative components of a successful collaborative research program go by different names on different campuses, and their duties are sometimes combined at smaller universities; nonetheless, they tend to carry out the same missions wherever they appear. These key units are generally known as offices of *Sponsored Programs* or *Research Administration* (to establish and manage collaborations); *Technology Transfer* or *Technology Licensing* (to decide when to seek patents and to negotiate patent-licensing agreements); *Development* (responsible for institutional fund raising); and *Corporate Relations* (to oversee the overall management of the institution’s relations with industry). In successful collaborations, university administration officials reinforce the efforts of such offices.

Beyond setting up the facilitative offices discussed previously, more and more U.S. colleges and universities are encouraging administrative teamwork by restructuring their institutions to co-locate these offices. For example, some report more and better internal cooperation and information flow after they moved the administrative activities that engage industry into a single facility. Others report benefits from merging or combining offices, such as Industry Relations and Technology Transfer. Given these findings, the State Council offers the following recommendation:

²⁰ *Working Together, Creating Knowledge*, p. 74.

RECOMMENDATION 6: Virginia’s public colleges and universities should:

- a. establish and maintain effective institutional offices (e.g., Technology Transfer; Corporate Relations) to support collaborations with industry, to communicate and manage expectations and to scout future potential opportunities; and**
- b. strengthen the coordination between and across these support offices, including co-location of some offices or functions.**

The campus administrators most frequently involved in research issues are vice presidents for research, deans, department chairs, and their staffs. Collectively, these officials are responsible for establishing and implementing institutional and departmental research policies, allocating resources, and coordinating with other entities on campus. Deans and department chairs often operate by themselves in smaller institutions and wield considerable influence in larger universities. Their positions often give them access to senior corporate research officials, and their knowledge of the research strengths of their institutions, as well as of corporate research priorities, can uniquely and strategically position them to identify fruitful areas for industry collaboration. In most colleges and universities, these administrators are well positioned to coordinate the efforts of the faculty, as well as the various offices discussed above.

Nationally, the colleges and universities that are successful in their collaborations with industry also tend to exhibit a willingness to (re)structure themselves to facilitate this success, which is often embodied by the institutions’ policies, processes and senior leadership. Specifically, such institutions appear willing to: (1) strive to base collaboration-related decisions on “how to make it work,” rather than on simply “following the rules;” (2) grant greater autonomy (with accountability) to decision makers; (3) ensure that faculty and administrators better understand the principles that should guide decisions about industry agreements; and (4) provide better communication and promote more teamwork among university personnel involved in negotiations with industry.²¹

Some institutions have also found that executive leadership can play a significant role in building support for collaborations with industry, especially when faculty (and staff) are expressing reluctance. While they need not be experts, presidents and senior administrators should strive to grasp the issues well enough to speak and understand the language of their staff collaboration experts. Institutions and presidents should also be willing, when necessary, to develop new procedures and performance measures that encourage teamwork on collaborative projects with industry.

RECOMMENDATION 7: Public colleges and universities should:

- a. cultivate institutional “champions” for collaborations with industry;**
- b. establish a cooperative tone toward industry collaborations from the top of the institutions down; and**
- c. align their incentive policies and processes to encourage cross-campus teamwork and to promote collaborations with industry.**

Addressing Collaborative-Agreement/Contract Issues. Across the U.S., when university-industry collaborations are of sufficient magnitude, more and more collaboration partners are opting to negotiate master contracts. Colleges and universities are also moving to develop model agreements for single research projects.²² Decisions regarding the ownership and control of the intellectual property that will result from these collaborations are major points of contention in negotiations of agreements/contracts. To avoid combining collaboration and licensing negotiations, successful partners tend to strive either to

²¹ Scope of Advisory Group 8, “Facilitating UC-Industry Relationships, Organization and Structure,” *Proceedings of the [University of California] President’s Retreat*, 1997.

²² *Working Together, Creating Knowledge*, p. 48.

resolve the issue of commercialization terms quickly or to defer the negotiation of licensing royalties until the project is complete.²³

RECOMMENDATION 8: The state entity in Recommendation #1 should:

- a. identify exemplary sections from model contracts/agreements that reduce or eliminate barriers to university-industry collaborations; and
- b. disseminate these models/sections to Virginia’s public colleges and universities.

RECOMMENDATION 9: Virginia’s public colleges and universities should:

- a. ensure that their patent, copyright and licensing policies comply with recent state and federal legislation; and
- b. consider structuring their policies to enhance industry collaboration and to facilitate intellectual-property commercialization.

FINAL CONSIDERATIONS

Virginia’s public colleges and universities, their real and potential corporate partners, as well as state and local government officials should never lose sight of the fact that research collaboration is not an end in itself. Rather, it is a means by which academic and industry scientists and researchers can advance their work, and companies can more quickly move new products into the marketplace, thereby serving not only the pursuit of new knowledge, but also all participants’ interests. In the past, concerns were sometimes expressed that campuses’ collaborations with industry could threaten the essence of what it meant to be academic institutions.

Even as such concerns wane today, the Commonwealth, as well as public institutions and their Boards, must guard against acts of omission and/or commission that could result in the devolution of Virginia’s strong public colleges and universities into contract research organizations, indebted to their sponsors and overly dependent on revenues from sponsored research and licensing fees. Adequate, long-term public financing of academic research has no substitute.

RECOMMENDATION 10: Neither the Commonwealth of Virginia nor its public colleges and universities should view industry funding as an appropriate substitute for adequate, long-term public financing of basic academic research.

²³ *Ibid*, p. 57.

**APPENDIX:
LEGISLATIVE MANDATE**

**VIRGINIA ACTS OF ASSEMBLY -- 2004 SESSION
CHAPTER 537**

An Act to direct the State Council of Higher Education for Virginia to develop policies and strategies to eliminate the barriers between the Commonwealth's institutions of higher education and industry and enhance the development of human capital in the Commonwealth.

Whereas, excellence in teaching at the undergraduate level and high-quality research are two main factors that contribute to a university's success; and

Whereas, a focus on quality research and teaching will bring about growth in revenues, attract higher quality students and faculty, and higher rankings for Virginia-based universities; and

Whereas, for the Commonwealth's universities to maintain and enhance their positions at the forefront of research on a national and international basis and draw industries to locate, incubate, and grow to maturity in Virginia, they must recruit and retain top faculty; and

Whereas, the competitiveness of Virginia-based universities lies in the hands of high-quality faculty and researchers with the drive to provide excellent education and build positive relationships with industry; and

Whereas, these relationships lead to research and development of new technologies; and

Whereas, bringing new technologies from the research laboratory to the marketplace requires academia and industry to work together in new and innovative ways; and

Whereas, investment in strategic areas will allow the Commonwealth to more fully benefit from its investments in higher education and economic development; and

Whereas, new technologies can spawn new industries leading to new jobs, new products, and new markets thereby multiplying their impact on the economy; now, therefore,

Be it enacted by the General Assembly of Virginia:

§ 1. *The State Council of Higher Education for Virginia (SCHEV) shall develop policies to eliminate the barriers between the Commonwealth's institutions of higher education and industry and enhance the development of human capital in the Commonwealth. These policies and strategies shall include a review of (i) offering incentives for industry to partner with universities in the practical training of undergraduate and graduate students; (ii) providing opportunities and incentives for corporate scientists and engineers to have adjunct appointments at universities to train and collaborate with faculty and students; (iii) assisting universities in acquiring funding to build or buy facilities where academic labs and corporate entities can work together; (iv) providing opportunities and assistance for academic researchers to take one- to two-year sabbaticals in a corporate setting or national lab and bring that experience back to the institution; (v) increasing the two-year leave of absence for science and engineering faculty to generate more industrial-sponsored research; (vi) allowing industry to fully fund faculty salaries and allow the faculty to work in industry while remaining a university employee, with proper safeguards in place; and (vii) allowing faculty to be part-time university employees and part-time industry employees, also with proper safeguards in place.*

The State Council of Higher Education for Virginia (SCHEV) shall report its findings to the Governor and the General Assembly by November 30, 2004.

§ 2. *All agencies of the Commonwealth shall provide assistance to SCHEV, for the development of these policies and strategies, upon request.*



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