Chapter 4

An Institutional Geography of Knowledge Exchange: Producers, Exports, Imports, Trade Routes, and Metacognitive Metropoles[[1]](#endnote-1)

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This paper examines knowledge exchanges between universities and other institutional arenas in American society. It develops a vocabulary for understanding key principles underlying these exchanges, and illustrates the major concepts in that vocabulary with examples drawn from a variety of institutional settings. A premise of this paper is that academe is only one of many locations in which knowledge structures are generated, and that knowledge structures generated elsewhere can provide the raw material for academic work, just as academic work can be appropriated for use in institutions outside of academe. Among many possible examples, knowledge structures generated outside of academe include formulas for successful popular culture products, frameworks to improve effectiveness in business, spiritual practices of Eastern religions insofar as they are tied to health benefits, human-centered design thinking in architecture, and scenario planning in the military.[[2]](#endnote-2)

Clark Kerr (1962) wrote of postwar research universities as “the service stations of society,” meaning that universities generated knowledge and expertise that helped direct and improve a wide range of organizations in their environment. His conception broadened the “Wisconsin idea” of service to the state to a much wider range of constituencies. In Kerr’s view, universities generate much new knowledge, and also provide assistance to other institutions in society. In the view I will develop here, the relationships between universities and other institutions are more reciprocal than Kerr suggested. In this respect, I see universities not as service stations, but rather as all-purpose cognitive production and processing plants. They create knowledge products on their own, while at the same time taking in conceptual material from a variety of external sources, rejecting some of this material, and in other cases feeding back tested and refined products, with greater or lesser impact, to the source institutions.

The approach developed in this paper is consistent with recent work in the economics of innovation that stresses the bidirectionality of influence between universities and industries and the multiple pathways by which universities influence industries and industries influence universities (see, e.g., Geiger and Sa 2008; Kenney and Mowery 2014; Powell et al. 2005). This work has led to a revision of the naive linear model of innovation in which universities (and other research units) discover and corporations produce. But so far, social scientists have offered little in the way of theorization that encompasses a wide range of institutional settings. My goal is to open avenues for this theorization by developing a conceptual vocabulary with which to understand the relationships and trade networks between research universities and other institutional sectors. In the absence of a large sample of knowledge structures that would allow for systematic study, I will illustrate applications of this approach with case studies drawn from a range of institutional settings.

In contrast to the position I will develop here, much of the best work of social scientists and intellectual historians has focused on knowledge produced in the disciplines and transactions among the academic disciplines (see, e.g. Abbott 2001; Gieryn 2008; Gorman 2010: Jacobs and Frickel 2009; Lamont 2008). We have many studies, for example, of how methods are borrowed from one discipline to expand the tools available to another. Abbott (2002) has discussed a number of such imports in sociology, including the borrowing of durational methods from biology, the borrowing of network modeling from physics, and the borrowing of alignment algorithms from the pattern-matching literature on DNA (p. 228). Similarly, Jacobs and Frickel (2010) discussed the permeability of boundaries among the disciplines, contesting the notion that disciplines are “silos” that resist important new ideas or methods from other disciplines. In subsequent work, Jacobs examined the diffusion of such ideas as postmodernism, actor-network theory, and social capital from their originating disciplines into neighboring disciplines (see also Jacobs 2014: 85–88).

Thus, many prominent academics see “true” knowledge as based in the verification processes, scientific and scholarly methods, and peer review found only in academe. They see knowledge that originates outside of academe as something less than authentic—not authoritative, not subjected to sufficient expert scrutiny, or not based on adequate verification.[[3]](#endnote-3) I explicitly depart from this view that “true” knowledge structures are very nearly coterminous with academic production. I disagree, for example, with assumptions embedded in Abbott’s (2002) observation that academic disciplines “provide models of learning and images of coherent discourse” that are “much better . . . than the competition” (p. 130). At their best, they are indeed much better than the competition, but being much better than the competition is rarely the point in the development of “images of coherent discourse.”

Knowledge produced outside of academe can have a studied, systematic quality that, like academic knowledge, distinguishes it from folkways or mere opinion. Typically, its validity has been subjected to some degree of critical scrutiny—though usually not at the level that would pass muster at the highest levels of academe. The disciplines are consequently not the only important spheres of knowledge production or coherent discourse. At the same time, they play a central role in knowledge verification, criticism, and refinement.

An Important Context: The Expansion of Advanced Degrees

The growth of graduate and professional education is an important backdrop for the themes developed in this paper. More than twenty-five million Americans have master’s or higher-level degrees, approximately the population of the six largest cities in the United States. More than three million people have doctorate degrees, the population of Los Angeles, the country’s second largest city (US Census Bureau 2014: table 2–01). The idea of a postindustrial society dominated by “knowledge workers” has not yet come to pass, but it is clear that a number of important industries are populated disproportionately by people with advanced degrees and, further, that these industries are among the leading contributors to GDP. If we identify the industries in the “knowledge sector” using the criterion of 5 percent of employees holding master’s level or higher degrees, the sector includes agricultural services, mass-media industries, chemicals, plastics, pharmaceuticals, computers and electronic equipment, scientific instruments, banking, accounting, consulting and other business services, medical services and hospitals, educational services (obviously including colleges and universities), legal services, and nearly all of government (Brint 2001, 2015; see also Powell and Snellman 2004). The knowledge sector, so defined, accounted for 43 percent of GDP by 2010 (Brint 2015).

Sociologists have speculated that one of the important outcomes of the growth of a “knowledge sector” populated by people with advanced degrees is a change in dominant thought styles. Baker (2014) has described these changes as “an epistemological revolution”:

The growth and intensity of science, rationalized inquiry, theory, [and] empirical methods [are] all influenced and reinforced. . . . [These changes can be] understood as . . . at the core of an epistemological revolution (Baker 2014: 189–190).

If Baker is correct, we should see a growing capacity, found primarily in those with advanced degrees, to think abstractly and to gather and weigh evidence in support of abstract conceptual frameworks, and thereby to order the world by these empirically anchored abstract conceptual frameworks.

Knowledge Structures

In this paper, I will be concerned with knowledge structures, rather than knowledge per se.[[4]](#endnote-4) Knowledge structures are akin to Thomas Kuhn’s (1972) paradigms; they provide a framework of interrelated concepts, results, and procedures within which subsequent work is structured. But knowledge structures, as I will use the term, do not necessarily originate in scientific achievements. Nor do they necessarily contain many inter-related parts or principles. Instead, they are coherent frameworks for understanding that regulate action within specific organizational and institutional contexts. They are based on empirical verification, or have the potential for such empirical verification. The “balanced scorecard,” for example, is a knowledge structure that provides a framework for managerial accountability within many corporations. It is based on abstract thinking about the key constituencies required for successful unit operation and metrics for scoring how well a manager is performing in relation to these key constituencies (Kaplan and Norton 1996). The potential for empirical verification related to unit effectiveness exists. Because knowledge structures make claims that can in principle be verified, knowledge structures are distinguishable from conceptual structures. The potential for verification may or may not be relevant to a conceptual structure, but, as I will use the term, it is always relevant to a knowledge structure. Religious systems, for example, are conceptual structures that are not subject to empirical verification. Like paradigms, knowledge structures do not typically impose a rigid or mechanical set of understandings and operations, but can be used more or less creatively and flexibly.

I will not argue that knowledge structures are the most important type of knowledge that is exchanged across institutional sectors. However, because of its “chunked” quality, good samples of knowledge structures can be identified and studied more easily than the nearly limitless amount of knowledge bits that flow across conversations, the media, and the Internet every day.

The Metaphor of Commodity Trade

A second premise of this paper is that commodity trade provides an illuminating metaphor through which to explore the interactions of academic knowledge structures with knowledge structures originating in other institutional domains. Ideally, one would like to map the institutional geography of knowledge exchange comprehensively, identify the types of knowledge commodities that become exports from academe and imports into academe, and show why some trade routes are well-traveled and others are rarely traveled at all. This would be the work of more than one lifetime. In this paper, I will therefore limit myself to providing a vocabulary for understanding the primary forms of interaction between academic knowledge and knowledge originating in other spheres of society, substituting these illustrations for a more comprehensive analysis. Similarly, I will not attempt to describe all trade routes. These would include many routes that bypass universities altogether, such as the analytical systems that private consulting firms develop and then provide for a fee to corporations, governments, and nonprofit organizations. Instead, I will focus solely on the relation of universities to other institutional spheres.

A better understanding of cross-institutional knowledge exchange processes is important for the same reason that knowledge structures themselves are important: they provide an influential, empirically grounded understanding of the world in which we live. Although my analysis leads to a partial dethronement of academe as the center of empirically grounded knowledge structures, it also brings into sharper relief the distinctive contribution of academe to the cultural organization of other institutional arenas in modern societies, as well as the content that these other institutional arenas can provide for the development of academic knowledge structures. Anyone interested in the cultural morphology of the modern world should, I believe, wish to take cross-institutional knowledge exchange processes into account. The shape of our world is produced in large part by the traffic and direction of these interactions—and by what happens to cultural goods in transit.

A Basic Vocabulary

Commodity trade is a useful metaphor for the processes I wish to explore, because it conjures images of goods mingling in busy ports in preparation for loading onto ships that traverse the globe. But in the cultural realm, commodity trade is a metaphor only. Exchanges of cultural goods do not require agreement on mutual advantage. Unless they have a protected legal status, cultural goods can be appropriated without cost and recirculated without charge. Cultural goods are typically not priced on a market, but rather flow back into practices based on whether or not they can overcome the mental preference for following existing mental constructs linked to action.

With these important differences in mind, I will use the metaphor of trade to develop a number of concepts that I believe illuminate and suggest hypotheses for future, more systematic studies of the institutional geography of exchange in knowledge structures. The basic vocabulary includes the following terms: knowledge-producing institutions, knowledge exports, knowledge imports, trade routes, corruptions and impositions, and metacognitive metropoles.

Knowledge-producing institutions are any institutions that create bodies of knowledge that shape practice and are based on more than assertion, convention, or opinion. Knowledge exports and imports are bodies of knowledge that pass into new institutional arenas and either are appropriated wholesale or are subjected to processes of testing, refinement, and revision that are consistent with the practices and purposes of the adopting institutional arena. The primary knowledge imports into academe are study topics and tropes and metaphors that influence knowledge structures. The primary knowledge exports from academe are verification tests, refinements, formalizations, and critiques. Many exports are not widely or fully adopted by trade partners, but in rare cases academic conceptualizations and analyses are so convincing that they transform practice in importing institutional arenas. Trade routes describe the direction and heaviness of the traffic from one institutional arena to another. Barriers to fair trade create corruptions in knowledge products or prevent the circulation of academically tested knowledge structures. These corruptions are typically consistent with the receiving institution’s preexisting practices and priorities. Conceptualizations associated with failed exchanges often tread too closely to fundamental ideological beliefs in the receiving institution’s legitimation repertoire. Metacognitive metropoles are the centers of adjudication of truth claims.

I will begin my exposition of this basic vocabulary with a brief discussion of the ways that institutional purposes and work processes shape the development of knowledge structures. I will then illustrate the vocabulary I am developing to study the institutional geography of knowledge exchange using cases drawn from a variety of institutional settings. I also develop several hypotheses that would be susceptible to systematic empirical investigation using a larger sample of knowledge structures.

Institutional Goals and Knowledge Structures

All institutional arenas have an important incentive to create processes that achieve the ends of the institution—whether these have to do with winning wars, creating profitable products, building commissionable buildings, or filling movie theaters. Moreover, every institutional arena operates under historically developed rules and conventions linked to the achievement of these goals. Businesses are in competition with one another for long-term growth. They are consequently highly motivated to search for systems that sustain market share and foster long-term growth under conditions of competition. They are also highly motivated to ensure efficient and effective allocation of resources and effort. Similarly, the costliness of modern war has led to elaborate planning activities to limit uncertainty to the extent possible, both prior to engagement and in preparation for future conflicts through postmortems following the secession of hostilities. Creative teams, by contrast, must enter many competitions, because they will inevitably fail much more often than they succeed. Deadline pressures of these competitions have fostered efforts to maximize the likelihood of producing creative and winning design in tight time frames. Both academics and their external institutional partners have a particular interest in the testing and refinement of broadly adopted goal-oriented knowledge structures and the practices that derive from them.

The main implication of this assumption about incentives is that knowledge exchanges are heavily weighted toward the institutional goals of the exporting institution. Business firms are not interested in knowledge structures that lead to mediocrity and decline in profitability or reputation. Military officers have scant interest in how other countries with less sophisticated technology have fought wars, unless they have continuing relevance to modern warfare. Creative teams are not interested in products that fail to satisfy clients or customers. In sports, new statistical approaches are welcomed so long as they do not challenge the enterprise’s fundamental commitment to improving the probabilities of achieving winning records. No institutionalized analytical tools in sports have focused on explaining the sources of prolonged periods of competitive mediocrity. Nor have any been developed to foster equality of competition.

Ideological resistance is the most common source of failure in knowledge exchange across institutional sectors. This resistance may be based on deeply held beliefs, or on an underlying sense of threat to the authority or prerogatives of elites. But the adoption and rejection of new knowledge structures is also influenced by (typically unexpressed) criteria relating to perceptions of fit and utility. Fit between the proposed model and the institutional environment is important (although difficult to measure in a nontautological way), as is efficiency and ease of use. For example, ranking systems of colleges that focus on raw retention, graduation, and employment rates are misleading, because they do not take into account the academic or sociodemographic characteristics of entering classes. Nevertheless, they have become popular among politicians, at least in part because they do not require statistical controls that may be difficult to obtain or difficult for the public (or politicians themselves) to understand.

Types of Knowledge Exchanges

Knowledge exchanges exist within this broader context set by institutional purposes and perceptions of fit and utility. In this section I illustrate the main forms of knowledge exchange: imports into academe, exports from academe, trade routes, and barriers to trade.

Imports into Academe

What sorts of knowledge structures are imported by academics from other institutional arenas? The most important clearly are study topics; academics very frequently take up knowledge structures developed in other institutional domains and subject them to study. But study topics are not the only imports. At a less visible level, academics have also imported organizing tropes and metaphors from other institutional domains. These less visible imports can have a deep structural importance when they shape the knowledge-generating and knowledge-adjudicating practices of academe.

Imported Study Topics. Narrow technical refinements are the bread and butter of many applied academic fields, such as toxicology and civil engineering. Study topics can be imported through referral when organizations lack the time or expertise to engage fully with problems of practice. An example of such a referral occurred in the late 1970s when a survey conducted by UNESCO indicated a global need for guidance about landslide hazard zonation. UNESCO suggested that the International Association of Engineering Geology carry out basic studies on landslide hazard zoning. Academic geologists were prominent in the compilation and organization of principles and practices for identifying unstable or potentially unstable areas (Varnes 1984). Following its publication, this document served as a guide for geological consultants, as well as government policy makers. Most standard setting work is undertaken by committees with mixed representation from professional groups, industry, government, and academe (see, e.g., Bureau of Consumer Protection 1983).[[5]](#endnote-5) We can hypothesize that when governments insist on disinterested study, or when industry and government lack the expertise to study high-stakes outcomes properly, university researchers will become centrally involved. Clinical trials represent classical cases in which industrial self-interest and government insistence on rigor lead to a prominent role for university medical researchers, though one that does not invariably avoid the taint of partiality due to dependence on pharmaceutical companies for lucrative future opportunities (see, e.g., Washburn 2000: 110–136).

More often, study topics are simply appropriated by academics with an interest in the institutional domain from which they originate. Knowledge structures related to the achievement of institutional ends are frequently appropriated by academics for testing, refinement, and in some cases formalization. These sorts of problems appeal to the broader intellectual interests of academics in testing whether prevailing ideas do or do not stand up to empirical scrutiny. Take, for example, the wide variety of business management strategies and systems that have been developed to make businesses more efficient or more socially conscious, and therefore more profitable in the long run. These include “management by objectives” (Drucker 1954), “Theory Z” (Ouichi 1981), “total quality management” (TQM) (Deming 1982), “the triple bottom line” (Elkington 1997), and the “balanced scorecard” (Kaplan and Norton 1996). In a few cases, academics have played a role in the creation of these management frameworks. But the primary role of academe has been to determine whether or not the knowledge structures created by businesspeople produce the intended results. This requires collection of data from many different firms that have enacted the system, comparison of those who have adopted to those who have not, control for potentially confounding variables (such as starting market position), and finally support, revision, or rejection of the approach. Some management practices pass out of practice before academics have had a chance to pass judgment, because of the time, expense, or clearly mixed results of their enactment.

Total quality management (TQM) provides a well-documented example of an imported knowledge structure. It was inspired by principles developed by W. Edwards Deming (1982) and Joseph M. Juran. Deming was an industrial consultant who spent some time in academe; Juran was an engineer ([Petersen 1999](#_ENREF_16)). TQM’s processes date back to quality control procedures in postwar Japanese manufacturing ([Powell 1995](#_ENREF_17)). In 1985 the US Navy introduced a system of operational improvement, formally labeled total quality management ([Houston and Dockstader 1998](#_ENREF_9" \o "Houston, 1998 #233)). From there, the TQM was applied to other government agencies and private manufacturing and service firms ([Powell 1995](#_ENREF_17" \o "Powell, 1995 #230)). While specific applications varied across industries, twelve factors were common in the TQM literature: committed leadership, adoption and communication of TQM, close customer relationships, close supplier relationships, benchmarking, increased training, open organization, employee empowerment, zero-defects mentality, flexible production, process improvement, and measurement ([Powell 1995](#_ENREF_17)).

The primary role of academe was to determine whether TQM produced the results intended. Many studies found support for a relationship between TQM and business success ([Easton and Jarrell 1998](#_ENREF_7" \o "Easton, 1998 #239); [Hackman and Wageman 1995](#_ENREF_8" \o "Hackman, 1995 #241); [Watson and Rao Korukonda 1995](#_ENREF_22" \o "Watson, 1995 #240)) and others suggesting revisions (Powell 1995; Reed, Lemak, and Montgomery 1996). TQM is no longer a dominant framework in business, in large part because later adopters were less likely than early adopters to customize its application, thus resulting in fewer benefits (Westphal, Gulati, and Shortell 1997). However, elements of TQM that were strongly supported by academic studies left a lasting impression on business practices and fostered new innovations, such as six-sigma and ISO certification (Miller, Hartwick, and Le Breton-Miller 2004).

These critical analysis and adjudication roles of academe are found in virtually every area of social innovation. In the field of educational studies, for example, state and national government officials, supported by the major philanthropic foundations, have championed knowledge structures that became embedded in national policy, such as the state testing required by the No Child Left Behind Act and the curriculum and assessment standards of the Common Core. Academic researchers investigated these politically dominant knowledge structures to examine their effectiveness in raising achievement and reducing gaps between subgroups, and to identify reasons for their successes and failures. Through their research on outcomes (Darling-Hammond 2007; Linn, Baker, and Betebenner 2002), academic researchers contributed to the negative verdict on NCLB that eventually emerged in the policy community. Even before the Common Core was fully launched, academics had developed testable criticisms related to whether its underlying learning theory was age-appropriate in early grades (Bomer and Maloch 2011), was or was not based on evidence (Cuban 2010), could reduce state variation when most variation was within rather than between states (Loveless 2012), or would reduce or add to achievement gaps between groups (Ravitch 2013). They also debated whether the liberal arts educational ideal on which it was based was appropriate for students whose interests and aptitudes vary widely (Carnevale, quoted in Goldstein 2012). These early criticisms will undoubtedly serve as hypotheses in studies of the outcomes of the Common Core curriculum when and if it is fully implemented.

Imported Tropes and Metaphors. A second important process through which nonacademic institutions influence academic production has to do with the search for metaphors and frames that can be used to illuminate scholarly and scientific topics. Tropes work at a deep, implicit level of cultural structuration. In perhaps the most sophisticated and wide-ranging demonstration of the role of tropes in the framing of academic work, the intellectual historian Hayden White (1973) famously identified four literary “emplotments” that characterized all history writing, even the most “synchronic”: romance (the journey of self-identification), comedy (the harmony of the natural and social, including causes for celebration), satire (the opposite of romance; people are captives of a corrupt world) , and tragedy (the failed effort to test the limits of the world, including the pathos of a hero’s blind spots or limitations). Nor has the quest for metathematics been limited to the humanities and social sciences. Stephen Jay Gould (1978) posited that Darwinism showed an affinity to the politics of Victorian gradualism, whereas punctuated equilibrium, the theory inspired by his own work, reflected the underlying outlook on social change of the 1960s protest movements in which Gould participated. In sociology we find evidence of extensive metaphorical borrowing—for example, from the telecommunications industry (adapted for cybernetics and network theory), from the political arena (adapted for considerations of occupational jurisdictions) from stagecraft (essential to Goffmanian dramatism), and from religion (as elements in Durkheimian approaches to secular rituals), to name just a few.

Exports from Academe

Conversely, the knowledge exports of academia can exercise an imprint over knowledge practices in other institutional domains. Academe plays a central role in testing, criticizing, refining, and formalizing knowledge structures originating in other institutional arenas. It also has the capacity to “colonize” knowledge space and work practice in other institutional arenas, although this is a much rarer outcome.

Test Results. A primary function of academe is to serve as a relatively disinterested testing site for knowledge structures generated in other institutional domains and to feedback new approaches based on these tests. In areas related to the public and nonprofit sector, academe appears to enjoy a privileged role. In areas in which profit making is a possibility, particularly if profits are large, private firms can be stronger competitors.

Although we tend to think of academe’s role in producing test results as being focused on more rationalized fields, such as medicine or business management, examples can be found throughout American institutional life, including in such unlikely places as the popular culture industries. Within the film industry, for example, formulas have long existed for predicting a film’s success. One set of formulas makes predictions based on business variables, such as number of screens contracted, marketing budget, genre, release date, success rate of producers, and marquee value of directors and stars. Another set of formulas makes predictions based on the “emotional torque” of narratives. In one version of the story formula, the main structural elements are the protagonist who is attempting to reach a goal, the antagonist who places obstacles in the way of the protagonist, and the relationship character who accompanies the protagonist on his or her journey and is often not listened to. The story ends when the protagonist achieves or relinquishes her goal, defeats or is defeated by the antagonist, and reconciles with the relationship character. The closer these things happen together, the higher the emotional power (Anders 2011).

Academics have examined the business formula, often throwing doubt on the importance of star power while affirming the significance of budget summer and holiday release, and the popularity of the historically highest-grossing genres (Brewer, Kelley, and Jozefowicz 2001), or concluding that because of the heavily right-tailed distribution, with infinite variance, no predictions of exceptional box office success are possible (DeVany and Walls 1999). In recent years, more sophisticated modeling has developed in which neural network methodologies are used to consider much more fine-grained story elements, including, for example, locale of the setting, how well the film takes advantage of the dramatic potential of the setting, and whether or not a woman is brought into peril. The specific features of these empirically derived predictive models are closely held by commercial firms, some founded by former academics and most drawing on the statistical expertise of academics or former academics (Barnes 2013; Gladwell 2006). A parallel case exists in the popular music industry, where firms such as Music Xray measure the mathematical relationships among melody, harmony, beat, tempo, rhythm, octave, pitch, chord progression, cadence, sonic brilliance, and frequency to identify “hit” clusters and to predict the probable success of new songs by their closeness to one of these clusters (Gladwell 2006). Naturally, a major concern about these tools is that they will lead to ever greater levels of imitation in popular culture industries, rather than to creativity.

Another unconventional but revealing example comes from the world of spiritual practices. Maharishi Mahesh Yogi introduced transcendental meditation in the 1950s as a mental calming and spiritual development practice ([Alexander, Boyer, and Alexander 1987](#_ENREF_1" \o "Alexander, 1987 #244)). The first tests of the physiological effects of TM were conducted in the early 1970s by Herbert Benson and his associates at the Harvard Medical School (Benson and associates 1975). Since then, the transcendental meditation movement has gained traction throughout the Western world, with practitioners using it to reduce anxiety, improve health, and achieve a heightened level of spirituality. Hundreds of academic tests of the effects of transcendental meditation have yielded mixed results. A consensus has developed that regular practice can have benefits for relief of stress and anxiety and for cardiovascular health, and can be prescribed for hypertension (see, e.g., Bai et al. 2015; [MacLean et al. 1997](#_ENREF_13); [Zamarra et al. 1996](#_ENREF_23)), though its benefits do not typically exceed those of other relaxation techniques or regular exercise. This medical support, while mixed, has helped to legitimize and expand the popularity of a practice that once appealed in the West only to a small segment of counter-cultural young people.

Refinements and Formalizations. Many industrial knowledge structures have been subjected to deeper scrutiny by university researchers, leading to improved practices. Less developed knowledge structures may give way to academically generated refinements when practical problems develop or persist. For example, frameworks and methods for separating compounds developed in university laboratories when it became clear that batch processing used in industry could not provide the quality or efficiency that would be desirable for many bulk goods. In some cases, these separations require total purification, as in electrolysis refining of bauxite ore for aluminum. In other cases, the separation process splits mixtures into other more valuable mixtures, as in crude oil refinery. Different techniques are suitable, depending on differences in chemical properties or physical properties such as shape, mass, density, or chemical affinity (Wilson, Adland, and Cooke 2000). Today, dozens of separation techniques exist, and most were developed in university laboratories.

Refinements of social knowledge structures may be less common, but they can be equally transformational. The evolution of user- (or human-) centered design (UCD) provides an example of the interplay of an early influential idea from industry and its refinement and formalization by academic researchers. In UCD the needs, wants, and limitations of end users are given centrality at each stage of the design process. The first seminal paper on the topic, by IBM engineers John D. Gould and Clayton Lewis (1985), identified several elements of user-centered design that remain central: early and continual focus on users; empirical measurement of usage; and iterative design whereby the product or system is developed, modified, tested, modified again, and tested again. Subsequent work by academic researchers led to elaboration of methods for understanding users, for prototyping, and for validating design. Affinity diagrams (compilations of user insights), personas, mental models, and use scenarios have been identified by academic researchers as valuable methods for probing the minds and practices of users (Wallach and Scholz 2012). The underlying ideas of UCD have been expanded well beyond their original focus on human-software interface to encompass a wide variety of products, processes, and organizational systems.

The engineering professor Donald A. Norman (1988) provided an adumbrated conceptual frame that focused on the broader world of design of “everyday things.” In Norman’s scheme, human-centered design focused on simplifying the structure of tasks, making things visible, getting the mapping of the product right, exploiting the powers of constraint, designing for error, exploring affordances (such as the historical connection between handles and pulling), and standardizing “when all else fails.” By mapping, Norman meant following the relationship between intentions and required actions, between actions and the resulting effect, and between information that is visible and the interpretation of the system state. Academic researchers such as William Rouse (2007) extended similar ideas to organizational systems and processes. The International Organisation for Standardization has institutionalized basic principles of human-centered design (ISO 2015), while industry has added new interests in the sources of physiological and emotional pleasure in design, as opposed to mere utility and convenience (see, e.g., Jordan 2000). These could easily become future topics for academic refinement and formalization.

Similarly, scenario-planning methodologies were imported into academe from the military and industry, where they were subsequently formalized and exported back to the military and industry, albeit with mixed reception. Scenario planning is used as a strategic tool for individuals and organizations to imagine realistic possible future scenarios to improve planning and decision-making processes ([Chermack, Lynham, and Ruona, 2001](#_ENREF_5" \o "Chermack, 2001 #257); [Varum and Melo 2010](#_ENREF_21" \o "Varum, 2010 #258)). Scenario planning originated in military war game planning led by the military strategist Herman Kahn, and was quickly adopted by the oil industry as an aid to think through and cope with uncertain environments (Schwartz 1991). The theoretical framework of scenario planning was researched, refined, and formalized by academic thinkers from RAND, the University of Pennsylvania’s Wharton School, and the University of Strathclyde (Georgantzas and Acar 1995). These scholars helped introduce alternative approaches to the generation of scenarios, such as mathematical models and algorithms, which did not rely solely on judgment and intuition (Georgantzas and Acar 1995). One of the pioneers of scenario planning, Kees Van der Heijden, moved from the Shell Oil Company to a university appointment in Scotland, where he formalized principles of scenario planning in a prizewinning book on strategy (Van der Heijden 1997). Although the methodology of scenario planning has become more sophisticated due to the work of academic researchers, the jury is still out with respect to whether scenario planning contributes to organizational learning or long-term stability (Chermack, Lyman, and Rouna 2001; Varum and Melo 2010). Nor is it clear how many business strategists and military planners faithfully follow Van der Heijden’s formalizations in the design of scenarios.

Critique. Critique is part of the lifeblood of the academic system, and a prelude to any serious quest for improved understanding or action. Critique without testing or refinement is a common occurrence in academic encounters with knowledge structures produced in other institutional settings. Indeed, whole libraries could undoubtedly be constructed of books and papers subjecting social knowledge structures to critique.[[6]](#endnote-6) Much of this work is irrelevant to understanding cross-institutional knowledge exchange because its impact exists solely within the community of academic commentators and critics. However, critiques can have influence even when refinements for use are not provided, when they induce rethinking in source institutions.

Prominent examples can be found in the world of knowledge structures surrounding hiring and promotion. Modern hiring practices attempt to control for racial-ethnic and gender biases by creating oversight offices concerned with equal employment opportunities (Dobbin 2009). We can consider these practices as knowledge structures because they have relied on elaborated criteria for evaluating applicants while incorporating articulated safeguards, and because they have included empirical testing for outcomes. Recent social-science studies have critiqued these knowledge structures for failing properly to account for “unconscious bias” or “implicit social cognition” that can influence the initial sorting of applicants’ qualifications (Greenwald and Banaji 1995). Similarly, management schemes such as the triple bottom line have been critiqued—in this case, by researchers who find applicable data difficult to find for the proposed social and ecological “bottom lines” (Slaper and Hall 2011). In most such cases of critique without refinement, researchers leave it up to actors in source institutions to devise refined knowledge structures to address their critiques—and of course, this often does not happen. The reconsideration of equal opportunity in light of “implicit social cognition” theory is a liminal case, because university researchers have developed tests, such as the Implicit Association Test (Greenwald, McGhee, and Schwartz 1998) to measure unconscious bias, but the tests have not at this time been accepted by employers — in part because other psychologists have criticized their validity (Azar 2008).

Colonization of Practice.[[7]](#endnote-7) New knowledge structures generated in academic libraries and laboratories sometimes so clearly appear to represent advances that they transform nonacademic institutions in short order. The importation of knowledge structures from positive psychology into the training of military soldiers and officers is a notable recent example (Seligman 2011). The US Army’s Comprehensive Soldier Fitness program derives from research on resilience conducted by psychologists associated with the Center for Positive Psychology at the University of Pennsylvania. The program includes tests for psychological fitness, online courses aiming to improve psychological fitness, and a master resilience training program for drill sergeants. The last component—the linchpin of the program, according to its director—focuses on building officers’ mental toughness, “signature strengths,” and capacity for strong relationships with troops in their platoons. More than one million soldiers have participated in the program. The focus on resilience is obviously appropriate in the context of military combat, though undertheorized in the past. The program, developed by Seligman and his associates, also meets efficiency criteria. It is easy to deliver, provides quick feedback on results, and builds on core competencies already required for military officers (Seligman 2011)

A more modest, and much less successful, example of the colonization process can be found in James Q. Wilson and George L. Kelling’s “broken windows” theory of policing (1982). Wilson and Kelling posited that evidence of neighborhood deterioration, such as an increase in the number of broken windows on a street, provided a leading indicator of social disorder and consequent probable increases in the crime rate. The prescription of the “broken windows” theory was for police to put additional emphasis on neighborhoods that appeared, on the basis of physical deterioration, to be in danger of becoming high-crime areas and to encourage community members, working with government and nonprofit organizations, to improve the physical appearance and sense of social order in their neighborhoods. The broken windows theory influenced policing practices, notably in New York City, where it gave rise to the “zero-tolerance” policy of police commissioner William Bratton, but also in other large cities. One appeal of the theory lay in its connection to aspects of communities that police can influence, such as visible signs of physical deterioration, rather than those they cannot, such as the availability of jobs. Another source of its appeal was its promise to allocate resources in an efficient, and seemingly progressive way by preventing future crimes from occurring rather than focusing resources exclusively on neighborhoods where crime was already rampant. However, the theory, as implemented, received stringent criticism from social scientists and community activists for, among other deficiencies, equating correlation with causation, ignoring underlying economic and social roots of crime, and contributing to higher levels of enmity towards police in closely monitored minority communities (see, e.g., Harcourt 2001; Sampson and Raudenbush 1999).

Trade Routes

Just as the traffic of finished goods is heavy from China to the United States and light between Iceland and sub-Saharan Africa, so too would it be possible to chart the movement of cultural goods, such as knowledge structures, across institutional sectors. In the absence of systematic study, we cannot identify the zones in which exchanges are common or those in which they are rare. We also cannot know why traffic on these routes is heavy or light. Consequently, hypotheses are the most that can be offered at this early stage of theorization.

Notwithstanding the political preferences of professors (Gross 2013), universities may engage in lower levels of exchange with institutional domains associated with political liberalism than with those associated with political conservatism. Politically conservative domains include manufacturing industries, small business, the military, the medical professions, finance, and other business services linked to the corporate economy (Brint 2015). In so far as this hypothesis is correct, an important source of this variation will likely be found in the degree of congruence in analytical languages between academic scientists and participants in these politically conservative institutional spheres. All organizations have an interest in knowledge structures that lead to greater effectiveness in the achievement of valued outcomes, but only some institutional domains are likely to have verification methods in place to evaluate whether valued outcomes are being met.

Outlying cases tend to reinforce this view. In the liberal institutional sphere, the volume of exchange between academe and nonacademic scientific research firms is likely heavier than in any other trade route; in the conservative sphere, the volume of exchange between academe and small business is likely lighter than elsewhere. The difference that congruent and incongruent analytical languages make is clear in these cases. Academics and other scientific researchers share congruent analytical languages; academics and small business people for the most part do not.

The mass media is a special case. Here the trade with academe is very heavy, but unlike other trade routes, the relationship between academics and journalists does not depend on speaking a congruent analytical language. Instead, journalists are reliant on academic experts to provide sourcing for informed opinions and provocative or illuminating results that may be of interest to their audiences. This leads to heavy traffic between the two, but low levels of penetration into the workings of mass-media institutions themselves.

Another factor affecting the volume of inter-institutional exchange may be the existence of conferences or other meeting spaces that foster interactions and relationship building between academics and practitioners. When practitioners and academics attend the same conferences, results of academic research can be fed back quickly into practice. Medicine is a prime example. Academic medical researchers are prominent presenters at virtually all conferences of medical practitioners (Ionnaides 2012). By contrast, in less technical fields knowledge development has more to do with new fads and fashions, or with government regulatory policies, than with academic testing and refinement. K–12 education is a notable example. Practitioners and academics do not attend the same conferences, and most K–12 educators do not see themselves as part of a scientifically governed ecosystem; instead, what tend to count for them are their relationships with students and the growth they observe in them, and what the government requires them to do in relation to accountability for learning assessments (Darling-Hammond 2004). Government is the intervening regulatory party, and researchers consequently attempt to make their case through policy makers rather than to educators. For this reason, the results of academic research are fed back much more slowly into the field, when they are fed back at all.

Barriers to Trade

We can think of successful cross-institutional exchanges as instances in which knowledge structures are handled without distortion, and in which barriers are not raised against the free flow of knowledge structures. I will briefly discuss three barriers to successful cross-institutional trade. In order of severity, they are (1) corrupted knowledge goods, (2) failed exchanges, and (3) blockades.

Corrupted Knowledge Goods. Often academic exports are selectively appropriated so that evidence that supports the agenda of an interest group or institutional value structure is adopted, while caveats and qualifications are not. The relationship between social-science evidence on marriage as a benefit and conservative religious institutions provides an example (e.g., Waite and Gallagher 2001). Conservative Christian groups have taken up supportive findings on marriage benefits, both because of the legitimacy of science and because of the value of empirical evidence for the success of their “family values” agenda (Klemp and Macedo 2009). At the same time, they have downplayed or ignored evidence that nonspouses can fulfill a role similar to that of spouses in single-parent families, and that some single-parent families succeed, provided that love and support exist in the household and behavioral norms for children are enforced (Entwistle, Alexander, and Olsen 1997). They have also ignored the evidence on the social and psychological difficulties faced by children whose parents are married but unhappy together (Sturge-Apple, Davies, and Cummings 2010).

We can analogize these processes to the dilution of medicine for profit by corrupt testing laboratories and commercial interests in the developing world. This is a common problem in global medical care. In the world of knowledge exports, we can hypothesize that corruptions occur both as a result of selective retention of ideologically harmonious findings and of simple corner-cutting and profiteering. Academic knowledge exported into political and religious institutions may be particularly prone to selective retention on ideological grounds, while academic knowledge exported into industry may be particularly prone to cost-saving corruption.

Failed Exchanges. Failed exchanges occur when one side of a potential exchange relationship determines that its priorities or interests will be harmed through the adoption of a new knowledge structure. Foundational beliefs linked to prerogatives of the powerful are a frequent source of failed exchanges. Disagreement within the community of experts can contribute significantly to failed exchanges, because dissenting views provide resources for opponents. The history of social indicators in the United States, led from the beginning by academic social scientists, illustrates these sources of failed exchanges. The social indicators movement started in the United States during the Depression era, but it never achieved institutionalization as an element of governmental policy (Cobb and Rixford 1998; Innes 1989). This stands in contrast to the acceptance of social indicators in Europe and in the developing world (Noll and Zipf 1994). In the United States, the social indicators movement was plagued by methodological issues and a proliferation of parameters of interest to investigators (Cobb and Rixford 1998). A proposal for a Council of Social Advisors and annual reports of social indicators, analogous to the Council of Economic Advisors, were opposed by the Reagan administration, and have not gained traction at the national level in the United States since that time (Cobb and Rixford 1998).

Failed exchanges also occur when university researchers propose knowledge structures that are misaligned with fundamental institutional purposes as perceived by gatekeepers. The theory of multiple intelligence provides an apt example. At the end of the twentieth century, buoyed by popular and scholarly skepticism, the academic psychologists Howard Gardner (1983) and Robert Sternberg (1985) developed theories of “multiple intelligences.” These new theories were both critiques of existing knowledge structures focusing on a single dimension of intelligence, and attempted efforts to refine them. Both psychologists attempted to justify the theories on empirical grounds. However, these alternative conceptualizations could not gain traction either in public schools or with college admissions offices. Public schools were under increasing pressure to reduce tracking and to show learning gains for all students (Mehta 2013). The leading college admissions offices remained focused on academic aptitudes and major accomplishments, presumably reflecting the primary purpose of the institution: the identification and development of cognitively talented and highly motivated students.[[8]](#endnote-8) In retrospect, this indifference to conceptions of multiple intelligences is impressive, given that these broader conceptions might have resulted in more diversified classes — a goal actively pursued by selective colleges and universities during the period. Perceptions of fit and utility may also have played a role. If tests based on multiple intelligence could have been proven to produce outstanding entering classes, at reasonable cost and without greatly complicating the admissions process, they would likely have received more attention from universities and the testing industry than they ultimately received.

Blockades. At an extreme, in highly politicized situations, all knowledge intercourse between institutional sectors may be blocked. The analyses and policies advocated by climate scientists ran into a wall of opposition from conservative business and political leaders during the time of the Bush and Trump administrations. These opponents distrusted the science and feared the costs that would be required to comply with new regulations on greenhouse gases (see, e.g., McCright and Dunlap 2010). Similarly, civil rights groups and their allies in the Democratic Party succeeded for two decades in blockading frameworks for understanding the contribution of family structure to the perpetuation of intergenerational poverty, by labeling such frameworks as tantamount to “blaming the victims” of poverty and racism (Patterson 2010). Blockades are commonplace in democracies whose parties require the support of powerful interest groups. In these circumstances, interest groups must be able to make it sufficiently costly for policymakers to depart from the interest groups’ position. Yet we may hypothesize that in societies where scientific literacy grows more important and the scientific community is undeterred by political pushback, the accumulation of evidence has a way of overcoming the opposition of politicized interest groups—even if it may take decades to do so.

Communication across Institutional Boundaries

I will conclude by taking up the question how knowledge producers rooted in different institutional settings communicate across sector boundaries. The historian of science Peter Galison (1997, 2010) has developed a vocabulary to discuss the language development processes involved. I believe this work may have application to the larger cross-institutional canvas on which I have been working in this paper. Galison’s focus has been on language development: the communicative mechanisms that develop within what he calls “trading zones,” or areas in which the pursuit of interdisciplinary interests can be stymied by failures to share a common language.[[9]](#endnote-9) For Galison, when issues of communication are solved, trading zones become, simply, trade. Galison discusses three mechanisms for the development of new languages: (1) inter-languages, strategically directed jargon that allows for sharing of key points of intersection, (2) pidgin, a more integrated language which nevertheless continues to contain elements of the specific expert languages of those contributing to a field, and (3) creoles, new languages developed through the selective adoption of features of the contributing expert languages. Nanotechnologists are still working through inter-languages, while biochemists have developed a full-blown creole that represents a free-standing language in its own right.

Along similar lines, Collins and Evans (2002, 2007) have highlighted the role of “interactional expertise”—people whose knowledge skills and intuitions are sufficient to allow for fruitful exchanges across expert community boundaries. These people are generally not capable of making substantive contributions to the work of experts in more than one interacting community, but they have the “translational” skills to understand both communities sufficiently to facilitate their joint progress. As Galison emphasizes, “Regularized and stripped down out-talk is not a lesser version of something else; rather, it is a register of scientific interaction that is supple and effective in its domain. The skills of someone versed in interactional expertise represent one specific register of scientific language” (Galison 2010: 48).

Certain capacities of the academic mind make it distinctive. These include its capacity to see problems whole, to capture key characteristics of problems, to assemble data from which authoritative evidence can be developed, and to subject these data to rigorous analysis. Those in other institutional realms develop conceptual knowledge, but they can rarely work with ideas in a way that allows them to identify key features capable of manipulation, or to investigate these key features in a systematic way. This is true for three reasons: (1) the self-selection of people capable of this work into the scientific domains of academe, (2) the training academics receive in making these types of judgments, and (3) the very different purposes of practitioners in other institutional arenas. Even if they are systematic in their thinking and are capable of comparing alternative approaches, practitioners do not typically have the time, or very often the inclination, to break up the whole into its component parts or to collect and study data carefully to develop conclusions about the advisability of specific understandings. In their use of knowledge structures, those who work in other institutional realms are inclined to satisfice rather than to inspect critically. When they are innovators, they may be inclined to sell their ideas, rather than to investigate them thoroughly. In the trade with academe, knowledge producers in other domains may simply hand over problems—this is a typical scenario—or allow them to be appropriated by academics for more careful analysis.

The ideas of Galison and his colleagues may prove useful in future studies of the trade in knowledge structures. We should be open to the discovery of cross-institutional interlanguages, pidgins, and creoles, as well as individuals who provide interactional expertise across borderlands. However, I doubt that these “languages” will be as important in cross-institutional studies as they are in the development of trade within expert communities in academe. Because those who communicate across institutional sectors do not share a common metacognitive orientation, new languages are less likely to develop. Academic expertise is the metacognitive orientation that sees problems in full, breaks down the elements of problems into categories that can be manipulated, interprets the key features of the problems as so classified, and collects data in a more or less systematic way to arrive at conclusions. Potential collaborators from outside academe must show the capacity to engage with this common metacognitive orientation in order to become full collaborators. Because relatively few do so, academics function both as investigators and translators, often aided by journalists in translational work.

In this respect, the centrality of academe in the world of knowledge production and trade can be reasserted—not as the sole, or perhaps even the principal, generator of knowledge structures, but as the home of the ultimate cultural authority (and the privileged work space) that permits knowledge generated both in universities and elsewhere to be examined, proven, deepened, revised, or rejected on the basis of evidence. As a feature in the cultural trade routes that crisscross institutional settings, academe alone is capable of functioning as the metacognitive metropole.

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1. Notes

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2. Academics have a natural desire to monopolize legitimate knowledge. To the extent that they can define academic knowledge as the only legitimate form of knowledge, the cultural capital of academe becomes a more valuable commodity, and the position of universities and professors gains in stability and status. Obviously, my position differs. It is important to separate the status and certification value of the institutionalized cultural capital of schools and universities from the more free-flowing (but nevertheless analyzable) intermingling of knowledge exports and imports in the cultural construction of the modern world. Among social scientists who have recognized that knowledge exists outside as well as inside academe, my position is distinctive in relation to its structural anchorage. I prefer to root my analysis in the core social structures of advanced industrial societies—particularly institutions, organizations, work settings, and interest groups—rather than in the more diffuse patterns of “bounded cultural units” in the Boasian tradition; the recipe knowledge of “ordinary social life,” as in Schutzian phenomenology; or interpretations of political psychology, as in Mannheimian ideology analysis. [↑](#endnote-ref-2)
3. One fundamental question is “What is knowledge?” All agree that knowledge requires truth claims. Idioms and practices that do not make truth claims may play an important role in society (e.g., satire) or even in brain activity (e.g., instrumental music), but they are not knowledge. Recent discussions about knowledge tend to divide between social constructionists (“Knowledge is an institutionalized truth claim, verifiable or not”) and positivists (“Knowledge is a truth claim that is subject to verification, and consequently refutation”). Both groups agree that knowledge goes beyond mere information or opinion; it is an organized body of understandings connected to some section of the empirically existing world (including texts). Both also agree that knowledge systems generate understandings of how specific parts of the world work, and may include implications for how to live based on “facts” (or “institutionalized understandings”), principles, and recipes for action. Although the social constructionists make an irrefutable point (i.e., that ideas we believe to be real are real in their consequences), a positivist definition of knowledge is essential to the study of the institutional geography of knowledge exchange, for, as I argue here, one of the most important functions of academe is the verification, revision, and refinement of truth claims that are susceptible to verification. [↑](#endnote-ref-3)
4. If we look at research statistics, it is obvious that knowledge production takes place outside of academe. For decades, statistics from the National Science Board in the United States have indicated that only about half of basic scientific research is conducted outside universities. Moreover, only a small fraction of total applied research is conducted in universities (National Science Board 2014: chapter 4). Many of the most important inventions of the period, from the Internet and GPS to the birth control pill and the pacemaker, were developed in government laboratories and private corporations by university-trained doctorates, sometimes but not always building on basic research conducted in universities (see, e.g., Isaacson 2014 on inventions related to computing and digital media.) [↑](#endnote-ref-4)
5. There are tens of thousands of product standards in use in industry. Many hundreds of groups, with thousands of committees and subcommittees, set standards for manufactured articles ranging from screw threads and safety devices for steam boilers to computer software. The American Society of Mechanical Engineers alone publishes nearly six hundred codes and standards; its annual income from the sale of such publications is in the tens of millions of dollars (ASME 2015). [↑](#endnote-ref-5)
6. The idea of facts themselves have been subjected to relentless critique by postmodern scholars influenced

by Michel Foucault and other social constructionists (see, e.g. Poovey 1998). These critiques, while important in the contextualization of historically contingent knowledge structures, have unfortunately contributed to a more general skepticism about whether objective understandings of observable phenomena are possible. [↑](#endnote-ref-6)
7. My view departs from the overgeneralized perspectives of Habermas (1984) on “the colonization of the lifeworld” and Foucault (1977) on “discursive practices” that construct the “carceral” institutions of modern societies. I focus instead on concrete instances of knowledge exports from academe that transform specific institutional practices outside academe. [↑](#endnote-ref-7)
8. This focus on academic aptitudes and major accomplishments has been offset to a degree by extra

 consideration given to applicants from families of alumni and especially donors, athletes, and

 minorities, among others (see, e.g., Soares 2007; Stevens 2007), [↑](#endnote-ref-8)
9. This is a phrase with obvious resonance to the vocabulary developed here, although I discovered

 Galison’s work only after I was quite far along in applying the metaphor of trade and a new vocabulary

 based on trade imagery to cultural exchanges. My thanks to Michael Olneck for bringing this work to

 my attention. [↑](#endnote-ref-9)