Sociology of Professions: Application to the Civil Engineering "Raise the Bar" Initiative

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Abstract: This paper applies the sociological theory of professions, as espoused by Abbott and Freidson, as a conceptual framework to assess the critical issues associated with the ongoing implementation of ASCE Policy Statement 465—also called the "Raise the Bar" initiative. The sociology of professions provides an objective basis for evaluating key aspects of the initiative, including publication of the civil engineering body of knowledge, raising educational standards for licensure, collaboration with other engineering disciplines, and defining the role of paraprofessionals. The analysis demonstrates the following: (1) the models of professionalism by Abbott and Freidson are highly applicable to civil engineering; (2) most aspects of Policy Statement 465 implementation are consistent with these models; (3) the initiative is contributing to the strength of the profession as intended; and (4) some future additions and adjustments appear to be warranted. From this analysis, the author derives recommendations for the future direction of the Raise the Bar initiative. **DOI: 10.1061/(ASCE)EI.1943-5541.0000043.**

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Background

For over a decade, ASCE has been engaged in an ambitious effort to better prepare civil engineering professionals to meet the technological, environmental, economic, social, and political challenges of the future. This "Raise the Bar" initiative attained an important milestone in October 1998, when the ASCE Board of Direction formally adopted Policy Statement 465. The most recent version of this policy is as follows:

> The ASCE supports the attainment of a body of knowledge for entry into the practice of civil engineering at the professional level. This would be accomplished through the adoption of appropriate engineering education and experience requirements as a prerequisite for licensure (ASCE 2007).

In conjunction with the implementation of Policy 465, ASCE initiated a comprehensive effort to formally define the profession's body of knowledge (BOK). The *Civil Engineering Body of Knowledge for the 21st Century* (ASCE 2004) was first published in January 2004. In response to feedback from across the profession, a revised edition (ASCE 2008) was released four years later. The BOK is defined in terms of 24 outcomes, which address five broad curricular areas:

- Fundamentals in math and natural science;
- Breadth in the humanities and social sciences;
- Technical breadth;
- Professional practice breadth; and
- Technical depth or specialization.

In contrast to traditional civil engineering curricula, as reflected in the accreditation criteria [Engineering Accreditation Commission (EAC) 2003] that were in effect when the original BOK was formulated, the most recent edition of the BOK places increased emphasis on the natural sciences, humanities, problem recognition, history and heritage, sustainability, risk and uncertainty, project management, public policy, business, public administration, globalization, leadership, and attitudes. A recently implemented change to the Accreditation Board for Engineering and Technology (ABET) civil engineering program criteria incorporates some, but not all, of these topics (EAC 2008).

As the BOK has been developed and refined, a concurrent analysis has demonstrated that the BOK outcomes cannot be adequately achieved through the traditional four-year baccalaureate degree. Consequently, Policy 465 specifies that the BOK should be fulfilled through (1) a baccalaureate degree in civil engineering; (2) a master's degree or approximately 30 graduate or upper-level undergraduate credits; and (3) appropriate progressive, structured engineering experience.

ASCE is currently attempting to influence state laws to reflect the increased educational requirement for licensure. In 2006, with ASCE's strong support, the National Council of Examiners for Engineering and Surveying (NCEES) modified its model law requirements for engineering licensure (NCEES 2006). The revised model law states that admission to the engineering licensing exam will require a bachelor's degree and an additional 30 credits of acceptable upper-level undergraduate or graduate-level coursework from approved course providers. In 2008, the effective date for the new model law was set at January 2020.

Although the implementation of Policy 465 has made steady and substantial progress since 1998, the process has often been contentious. Various aspects of the initiative have been opposed by individual educators and practitioners, the Engineering Deans

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Council (ASEE 2006), the American Council of Engineering Companies (ACEC 2008), and professional societies affiliated with other engineering disciplines (Holt 2009). These disagreements have concerned a wide range of issues, including the nature and severity of the problem, the need for additional education, quality versus quantity of engineers, accreditation, the importance of licensure, the relationships among the engineering disciplines, and the respective roles of educators, practitioners, and paraprofessionals. In response, proponents have sought to legitimize the Raise the Bar initiative by citing various strategic vision documents [National Academy of Engineering (NAE) 2004, 2005] and empirical data, e.g., reduced credit hour requirements in civil engineering programs and increased educational requirements in other professions. Opponents have also occasionally cited empirical data, e.g., the lack of any significant decline in Fundamentals of Engineering Exam pass rates. In general, however, most participants in the debate have relied primarily on anecdotal evidence, personal experience, and speculation about the future consequences of the initiative (NCEES 2009). Thus far, neither advocates nor opponents have sought to assess the validity of Policy 465 in the context of a broader theoretical framework. Yet just such a framework exists in an extensive body of scholarship called the sociology of professions.

Purpose and Scope

The purpose of the paper is to apply the sociological theory of professions to assess the implementation of ASCE's Policy Statement 465. The research question is as follows: is Policy Statement 465 being implemented in a manner that will tend to strengthen the civil engineering profession? To establish a basis for this analysis, the historical development of the sociology of professions is summarized, and the theoretical models proposed by Abbott and Freidson are identified as being particularly applicable to civil engineering. Critical issues associated with Policy 465 are then analyzed in the context of these models. Consistencies and inconsistencies are identified, and concomitant recommendations for the future direction of the Raise the Bar initiative are proposed.

Sociology of Professions

Although modern professions are thought to have their origins in the medieval guilds, the formal academic study of professionalism did not begin until the 1930s. Many early sociological studies attempted to identify the essential traits of "true professions" and then to examine various real-world occupations with respect to these traits (Carr-Saunders and Wilson 1933). This approach eventually fell out of favor because the subjectivity inherent in defining essential traits often resulted in inconsistent conclusions. Thus, for example, "If one disliked social work, one easily found some trait excluding social work from the prestigious category of 'professions'" (Abbott 1988, p. 4).

Through the middle years of the twentieth century, the study of professions was heavily influenced by *functionalism*, the dominant theoretical framework of modern sociology. Functionalists have attempted to define the role that the professions play in the established order of society (MacDonald 1995). For example, the functionalist perspective can be seen in the concept of "asymmetry of expertise"—the idea that the professional's specialized expertise requires the client to trust the professional, and the professional is ethically obligated to serve the client's best interest (Lawson 2004). Although much of the literature on professions reflects a functionalist orientation, some recent theorists have described this approach as fundamentally limited because it is focused primarily on what professions are, rather than how they develop and maintain their special position in the marketplace (MacDonald 1995).

An alternative approach is seen in another midtwentieth century development—the theory of *professionalization*. This theory suggests that all real-world professions are developing along a path toward an ideal end state. Advocates of professionalization favor its focus on development over time, rather than static traits, and its utility in explaining the inherent variability in the empirical characteristics of real-world professions. More recently, in response to the changing political climate of the 1960s, Larson (1977) examined professionalization in terms of the professions' tendency to acquire monopolistic control over both markets and social status. The theory of professionalization also has its critics, who cite its inability to account for the interactions between professions and the loss of professional status occasionally experienced by real-world occupations (Abbott 1988, p. 18).

In 1988, Andrew Abbott revolutionized the sociology of professions with his publication of *The System of Professions*. Abbott's approach is unique in that he applies systems analysis concepts to characterize the professions as interdependent elements of a complex, dynamic system. At the heart of Abbott's model is the concept of *jurisdiction*—the link between a profession and its work. Each profession claims a jurisdiction on the basis of its associated body of expert knowledge. Control of a jurisdiction generally entails the right to perform work as the profession sees fit, to exclude others from doing the same work, and to publicly define the tasks being performed.

Within Abbott's system of professions, a *disturbance* is created when one occupation attempts to claim another's jurisdiction, or when external forces (such as technological change) create new jurisdictions or destroy existing jurisdictions. The disturbance then propagates through the system as a succession of jurisdictional contests between occupations. Eventually the disturbance is absorbed, either by professionalization of a nonprofessional occupation, by deprofessionalization of a professional group, or by internal changes within a profession. Ultimately the outcomes of these jurisdictional disputes determine whether professions prosper, combine, divide, stratify, or fail. Because professional tasks are constantly changing, new jurisdictional disputes are always arising. Consequently, there can be no long-term equilibrium in the system.

In *Professionalism: The Third Logic*, Eliot Freidson (2001) draws heavily upon both Abbott and Larson but adopts a fundamentally different approach. Rather than describing the historical development of professions or characterizing them at a particular place and time, Freidson develops the *logic of professionalism* as one of three paradigms for the division of labor in an economic system. These three paradigms are as follows:

- The *free market*, first articulated by Adam Smith in *The Wealth of Nations*, is a labor market in which the division of labor is determined by consumers. An ideal-typical free market is characterized by free entry and exit, complete knowledge of the marketplace, a sufficient number of buyers and sellers, and the absence of collusion. Workers in an ideal free market have little need for specialized training; they acquire working knowledge on the job. They move freely from one job to the next, based on available wage rates, and their work is seldom recognized as belonging to distinct occupations.
- The *bureaucracy*, as defined by Max Weber, is an entity in which the division of labor is determined by an organizational hierarchy (Weber 1947). The ideal-typical bureaucracy is characterized by a systematic organization with jobs defined by

written rules specifying function and position in the organizational hierarchy. In an ideal-typical bureaucracy, hiring is based on impersonal criteria and personnel policies, and wages are based on position and seniority. Workers' ultimate responsibility is to a supervisor, rather than to consumers of the organization's products and services.
- The *profession*, Freidson's "third logic," is an occupation in which the division of labor is determined by the members of the occupation itself. The essential characteristic of an ideal-typical profession is the ability of its members to control their own work through the discretionary application of specialized knowledge.

More specifically, the third logic—the ideal-typical profession—is defined in terms of five interdependent elements (Freidson 2001, p. 127) as follows:

- Specialized work, grounded in an officially recognized body of knowledge that is based on abstract concepts and requires the exercise of discretion;
- Exclusive jurisdiction in a division of labor created and controlled by the occupation;
- A sheltered position in the labor market based on qualifying credentials created by the occupation;
- A formal training program that lies outside the labor market, produces the credential, is controlled by the occupation, and is associated with higher education; and
- An ideology that serves one or more transcendent values and claims greater commitment to doing good work than to economic reward.

It is important to recognize that all three of Freidson's paradigms—free market, bureaucracy, and profession—are theoretical ideal types. As defined in the *Encyclopedia Britannica*, an ideal type is an analytical construct that is "derived from observable reality although not conforming to it in detail because of deliberate simplification and exaggeration." An ideal type captures the essential distinguishing characteristics of a phenomenon without attempting to reflect all of the specific characteristics of empirical examples.

Thus the strength of Freidson's ideal-typical model is that its formulation relies primarily on logic. It provides a stable, rationally derived conceptual framework that can effectively organize our view of professionalism, independent of highly variable real-world circumstances.

Although Abbott and Freidson address professionalism generally and theoretically, they also provide numerous examples and case studies illustrating the historical development and current status of many modern professions, including engineering. Other scholars have applied aspects of the sociology of professions to more narrowly focused analyses of the medical profession (Epstein and Hundert 2002), the military profession (Snider and Watkins 2002), the engineering profession (Krause 1999), and the civil engineering specifically (Lawson 2004). Yet, despite its broad acceptance and rich content, the sociology of professions has not yet been applied rigorously to ASCE's Raise the Bar initiative.

Application to ASCE Policy Statement 465

Taken together, the theories of Abbott and Freidson provide a powerful framework for evaluating the strength of a given real-world profession. According to Abbott, the strength of a profession is manifested in its ability to maintain exclusive control over its jurisdiction. The sources of that strength are reflected in the five elements of Freidson's ideal-typical model. Thus the strength of a real-world profession can be measured by the extent to which its characteristics reflect those of the ideal-typical model.

As such, Freidson's model also provides an effective basis for evaluating the implementation of Policy 465. Any aspect of this initiative that tends to move the civil engineering profession closer to Freidson's ideal-typical model can be regarded as a strengthening influence; any aspect that contradicts the model is likely to weaken the profession. In the following sections, this approach is applied to an analysis of the civil engineering profession in general and critical issues associated with Policy 465 in particular.

Although this analysis derives principally from the work of Abbott and Freidson, their theories are not claimed to be universally accepted and other valid perspectives on professionalism do exist. Nonetheless, Abbott and Freidson are appropriately authoritative sources, as reflected in the frequent citations of their work in the literature; moreover, as this analysis will demonstrate, their theories are particularly applicable to civil engineering and thus are particularly well suited to the purpose of this paper.

Body of Knowledge

Formalizing the Professional Body of Knowledge

In both Abbott's and Freidson's theoretical models, a body of specialized knowledge is central to professionalism. A profession's BOK is the principal basis for its jurisdictional claims compared with other occupations. Using historical examples, Abbott (1988, p. 56) demonstrates that jurisdictional claims are generally strengthened when a profession defines the boundaries of its jurisdiction more clearly. Thus, ASCE's decision to formally define and publish the civil engineering BOK can be expected to strengthen the profession by clearly and publicly delineating its jurisdictional claims. This conclusion is supported by the fact that, in the years since ASCE first published its BOK, at least three other engineering societies have initiated projects to do the same (AAEE 2008; Johnson 2009; Laity 2004).

There are potential risks in formally defining a BOK, however. The system of professions is inherently dynamic, with contested jurisdictions constantly in flux. A profession that formally defines its BOK may hinder its ability to adapt its jurisdictional boundaries in response to emerging threats or opportunities. ASCE has mitigated this risk in two ways—first, by defining its BOK in terms of outcomes, rather than specific content; and, second, by committing to regular updates of the published BOK (ASCE 2008).

Consider the case of *sustainability*, an emerging area of intense interest over which engineers, scientists, architects, public policy professionals, and a variety of other occupations have claimed some jurisdiction. The first edition of ASCE's published BOK did not include sustainability as a stand-alone outcome, but the second edition did—a clear use of the published BOK to strengthen a jurisdictional claim. Of course, merely claiming a jurisdiction does not guarantee that the claimant will actually be able to control the associated professional work. The outcomes of jurisdictional contests are determined, more often than not, by the efficacy of the "treatments" offered by the contesting professions (Abbott 1988, p. 100). It remains to be seen whether civil engineers will be able to develop treatments that are more effective at solving sustainability problems than the solutions offered by other occupations.

Abstraction and Discretionary Judgment in the BOK

The most important characteristic of a professional BOK is the nature of the expert knowledge contained therein. According to

Freidson, the BOK of an ideal-typical profession must be based on abstract concepts or theories, and the application of these theories must entail the exercise of discretionary judgment. Professional work

> requires extensive exercise of discretionary judgment rather than the choice and routine application of a limited number of mechanical techniques. Hence it is more important to have a firm grounding in basic theory and concepts to guide discretionary judgment than to gain practice in what can only be a selection from among all the concrete practical and working knowledge that particular work settings require (Freidson 2001, p. 95).

When a BOK is strongly grounded in abstract knowledge, the associated profession has a considerable advantage in jurisdictional contests. For example, in the 1960s, much of the exploding demand for electrical engineers in the United States was met by physicists, rather than engineers. The physicists' highly theoretical educational background enabled them to master new applications at least as easily as did the graduates of engineering schools (Abbott 1988, p. 181).

Conversely, lack of abstraction can weaken a profession and leave it vulnerable to attack or obsolescence. Abbott suggests that the professional railroad dispatchers of the early twentieth century might have evolved into today's systems engineers if their BOK had been sufficiently generalizable. In practice, however, their expert knowledge was too closely tied to the practical task of managing railroads; so when the railroads vanished, the dispatchers vanished along with them (Abbott 1988, p. 93).

The application of discretionary judgment is also critical to professionalism. If a profession's BOK can be codified or automated—that is, if decisions regarding the disciplinary domain can be made without the exercise of discretion—the professional's role is greatly diminished, and the profession is correspondingly weakened. Engineering is inherently susceptible to this tendency because "the body of engineering knowledge is so exact that it is constantly in danger of obsolescence through mechanization or advances in knowledge and technique, and its workers are susceptible to displacement by workers with lesser training" (Freidson 2001, p. 169). Krause (1999, p. 33) also emphasizes that engineers' expert knowledge is particularly vulnerable to new technological developments.

Given the importance of abstraction, the civil engineering BOK's enhanced emphasis on theoretical subjects—mathematics, natural science, and engineering science—is a positive change. The requirement for enhanced technical depth, attained through graduate-level study, is also laudable because it reflects a trend toward a higher level of specialized knowledge. Moreover, the BOK's emphasis on risk and uncertainty represents an appropriate counter to the notion that engineering knowledge is too exact.

Another salient feature of the formally defined civil engineering BOK is enhanced professional practice breadth, reflected in outcomes associated with such topics as communication skills, public policy, business, public administration, globalization, and teamwork. Freidson's model suggests that because these outcomes are not specific to the civil engineering discipline, they will not directly contribute to the profession's ability to defend its core jurisdiction. In a broader sense, however, there is considerable evidence that such knowledge and skills will significantly enhance engineers' ability to exercise discretionary judgment by providing a broader, more holistic context for decision-making (Augustine 2009; Grasso 2008). Therefore, inclusion of professional practice outcomes in the civil engineering BOK is appropriate, as long as these subjects do not displace critical math, science, or engineering content. Raising the academic prerequisite for licensure will alleviate this constraint considerably by shifting technical depth to the graduate level while opening up space for professional practice topics in the baccalaureate curriculum.

Humanities in the BOK

An ideal professional education is generally accompanied by "book learning in the academic or liberal studies of the ideas, theories, and works treasured by the cultivated elite" (Freidson 2001, p. 96). Most professions claim that the liberal arts provide an intellectual foundation for learning the professional BOK. Freidson suggests that these studies are at least as important for preserving the social status desired by professionals. Regardless, the humanities and social sciences are included as foundational outcomes in the civil engineering BOK, and this emphasis is consistent with the model of ideal-typical professionalism.

Professional Labor Market Shelter and Licensure

The most fundamental characteristic of professionalism, control of work by the occupation itself, requires the establishment of a *labor market shelter*—a monopoly over the specialized work performed by members of the profession (Freidson 2001, p. 78). Ideally, the monopoly is sanctioned by law: the state mandates that only qualified professionals can perform specified types of work. The mechanism for this mandate is a *credential*—typically a professional license that is created and granted by the profession.

The purposes of the labor market shelter are to protect the profession from external competition with other occupations, to protect it from internal competition between members of the profession, and to alleviate financial encumbrances that might adversely affect professionals' ability to serve their clients effectively. The state provides protection from external competition by granting the profession exclusive permission to perform certain types of specialized work. The profession controls internal competition through restraints on competitive bidding and advertising. Ideally, the profession also restricts its supply of practitioners by setting rigorous standards for admission into professional schools and for attainment of the credential.

Because they deliberately limit competition, professional labor market shelters are often viewed negatively by consumers. Yet they are absolutely essential for the viability of professionalism; therefore, they ultimately benefit society by ensuring that professionals' specialized knowledge is available in the marketplace.

In engineering, the labor market shelter is institutionalized through laws requiring professional licensure for certain kinds of engineering work. Licensure is, by definition, exclusionary: granting one profession the right to use a professional title and to do specified work excludes all others from doing the same. The state also privileges licensed professionals by applying the malpractice standard, rather than the strict liability standard, to their work (Jacobson 2009). For these reasons, licensure laws tend to strengthen the segment of the engineering profession to which they apply.

In this context, the existence of an *industrial exemption*, by which engineers working in manufacturing industries are permitted to practice without licensure, is highly damaging to the strength of the profession. When engineers practice under an industrial exemption, the employing company assumes liability for their work (Timms 2009). Thus the engineers effectively surrender control of their work to an organizational hierarchy. The result is a labor market that corresponds more closely to Freidson's "second logic"—the bureaucracy—than to professionalism.

Viewed from this perspective, ASCE's continued emphasis on professional licensure—in Policy 465 itself, in the published BOK, and in ongoing efforts to influence state licensure laws—is both exemplary and essential. Raising the educational standard for engineering licensure will further strengthen the labor market shelter and strengthen the portion of the profession to which the standard applies. Yet the lack of a "monopoly licensure system," applicable to all engineers, will continue to fundamentally compromise the strength of the profession (Krause 1999, p. 62).

Professionalism versus Bureaucracy in the Engineering Disciplines

As the preceding discussion suggests, there is an inherent tension between professionalism and bureaucracy. A recent example can be seen in the medical profession, in which large hospitals, health maintenance organizations, and other bureaucratic structures have been created to control costs by limiting physicians' discretionary control over their own work.

Engineering is regarded as an inherently weak profession because of the corporate setting in which engineering work is typically performed (Krause 1999, p. 35). Because the process of translating engineering designs into physical products requires large amounts of capital, engineers are often dependent on large privately owned organizations (Abbott 1988, p. 156). In such organizations, engineering typically represents just one specialty in a much larger division of labor. Consequently, engineers, unlike lawyers and accountants, cannot control the market for their services and generally have not been able to dominate the organizations in which they work (Krause 1999, p. 61). Freidson cites one notable exception to this rule, however.

> Today, there are a few powerful and wealthy engineering corporations that are analogous to the autonomous professional organizations of large law and accounting firms, but by and large such independent practice in industrial nations is rare *for all but civil engineers* [emphasis added] (Freidson 2001, p. 168).

Although Freidson provides no direct explanation for the exceptional nature of civil engineering, reasons can be seen in the nature of civil engineering work and its relationship to the professional labor market shelter. In comparison with the work other engineering disciplines perform, civil engineering products are more likely to require the seal of a licensed professional. This is the case because the products of civil engineering typically are created and remain within a single legal jurisdiction. Conversely, manufactured products are usually sold outside of the states in which they are made; thus, federal protection of interstate commerce prevents state regulation of this form of engineering work. [For an example of a licensure exemption based on interstate commerce, see New York State Education Department (2009) Article 145, §7208.j.] Consequently, a significantly greater proportion of civil engineers seek professional licensure (Fig. 1), and a correspondingly smaller proportion practice under an industrial exemption.

Two other inherent characteristics of civil engineering work tend to strengthen the profession in comparison with other engineering disciplines. First, the U.S. construction industry segregates the professional functions of planning and design from the more craft-oriented functions of fabrication and construction. In manufacturing industries, design and production are more integrated—an arrangement that, no doubt, enhances quality and efficiency, but also blurs the distinction between professional and nonprofessional work.

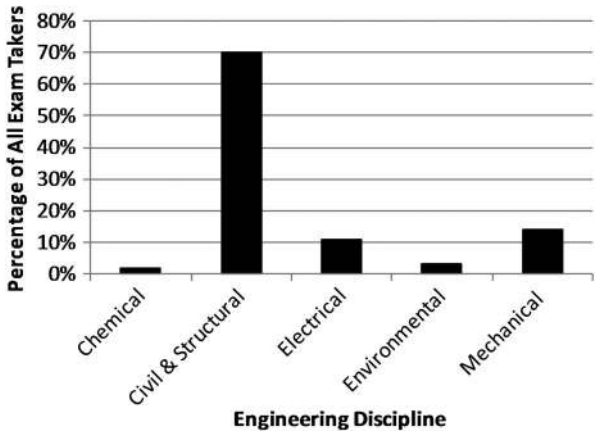

Fig. 1. Percentage of PE exam takers by engineering discipline for the past five years (data from T. Miller, NCEES director of examination services, personal communication, 2009)

Second, civil engineers typically create large-scale one-of-a-kind systems that must be designed correctly on the first attempt. Unlike engineers in manufacturing industries, civil engineers cannot build and test physical prototypes before handing off their designs for production. In theory, a profession that gets only one chance to solve a problem tends to be stronger than a profession that is allowed multiple attempts (Abbott 1988, p. 49). The latter is more vulnerable because it will inevitably experience more "treatment failures," and these are often the basis for jurisdictional attacks or loss of professional status.

Abbott and Freidson assert that the engineering profession is inherently weak because of its organizational context; nonetheless, the preceding observations demonstrate that individual engineering disciplines vary widely in this respect. Freidson himself acknowledges that civil engineering is different. Given the broad spectrum of real-world possibilities ranging from the ideal-typical profession (reflecting pure occupational control of work) to the ideal-typical bureaucracy (reflecting organizational control of work), civil engineering is demonstrably closer to the ideal-typical profession than engineering disciplines that are more heavily engaged in manufacturing.

It is hardly surprising, then, that professional societies representing other engineering disciplines have opposed ASCE's Raise the Bar initiative. Manufacturing-oriented disciplines are closely controlled by the commercial industries they serve (Krause 1999, p. 67). Historically, these industries have opposed engineers' efforts to professionalize to preserve flexibility and obtain technical skills at the lowest possible cost (Freidson 2001, p. 170). According to Abbott (1988, p. 154), corporations typically hire at the baccalaureate level to save money and then provide in-house training as a means of building their employees' loyalty to the firm, rather than to the profession, and to better protect proprietary information.

Deborah Grubbe reinforces this point powerfully, if unintentionally, in a recent opinion piece (Grubbe 2009). A petroleum industry executive, Grubbe opposes ASCE's Raise the Bar initiative on the grounds that increased educational requirements for engineers would be irrelevant to "wealth-generating businesses," such as the petrochemical, aerospace, automotive, and electronics industries. Because these industries transform raw materials into salable products, she says, they generate more "raw wealth" than the service industries that employ civil engineers. Therefore, "wealth-generating businesses" have more money to spend on the in-house training of their engineers. These firms "have no need for B + 30 [a baccalaureate degree plus 30 additional credits] when a B.S. will do

just fine" (Grubbe 2009). This argument clearly reinforces Abbott's point about corporate hiring practices, yet it fails to account for the fact that the "B + 30" standard applies to licensure, but engineers working in "wealth-generating businesses" practice under an industrial exemption and seldom seek licensure.

Significantly, industry groups and professional societies associated with manufacturing-oriented engineering disciplines have been most vocal in warning that raising standards for licensure will cause shortages of engineers. In practice, claims of an impending engineer shortage have been disputed (Teitelbaum 2007); and, in any event, the law of supply and demand suggests that any shortage of engineers could be addressed by raising salaries. Thus industries' warnings of engineer shortages can reasonably be interpreted as attempts to preserve the availability of low-cost engineering services. As noted previously, strong professions typically seek to restrict the number of practitioners by setting rigorous standards for attainment of the professional credential. In contrast, efforts to increase the number of engineering practitioners by resisting higher licensing standards clearly reflect the best interests of industry and not of the engineering profession.

For these reasons, it may be unrealistic for ASCE to expect cooperation from all but closely related disciplines in implementing Policy 465. In general, the engineering disciplines' ability to act in concert with one another is limited by "fragmentation into a variety of virtually unrelated specialties practicing in so many industrial sectors that few common interests link its members" (Freidson 2001, p. 170). It has even been suggested that engineering should not be considered a single profession at all. "Engineering, despite the single name given to practitioners, in fact competes largely by specialty—civil, mechanical, and so on—and should really be treated as several professions" (Abbott 1988, p. 82). In Abbott's systems model, the separate engineering professions are as likely to be competitors as collaborators.

This is not to say that ASCE is destined to go it alone. The American Academy of Environmental Engineers, the National Society for Professional Engineers, and the National Council of Examiners for Engineering and Surveying are natural allies. Many educators and practitioners in other engineering disciplines support the initiative, even in cases in which their professional societies do not. More importantly, historical examples suggest that, when one occupational group raises its professional standards, competing professions often feel compelled to respond by raising their standards as well (Abbott 1988, p. 97). If ASCE leads, there is good reason to anticipate that others will follow.

Role of the University

A key aspect of professionalism is its connection to the university—a connection that distinguishes professionals from craftsmen, who are typically trained on the job. Like training in the craft occupations, professional education is controlled and conducted by members of the profession. Unlike the crafts, professional education is generally provided by full-time teachers who are not expected to work in the labor market (Freidson 2001, p. 92).

In engineering, professional control over education is exerted primarily through accreditation by the EAC of ABET. As ABET member societies, professional engineering organizations contribute to the formulation of accreditation criteria and provide volunteers to serve as program evaluators. Accreditation connects to professional licensure through state requirements for an EAC-accredited degree as one of the prerequisites for qualification as an engineering intern and, subsequently, as a professional engineer. Given these connections, ASCE's effort to enhance educational fulfillment of the BOK through modifications to the EAC criteria is an appropriate mechanism for strengthening the profession.

In Freidson's ideal-typical model, university programs

- Prepare students to attain the professional credential;
- Formalize the BOK by incorporating it into the curriculum;
- Provide the educational basis for jurisdictional claims in relation to other professions;
- Refine and expand the BOK through research;
- Serve as the primary source of the profession's status and public identity;
- Contribute to students' commitment to the profession as a career; and
- Contribute to a shared identity among members of the profession.

Of all these purposes, both Abbott and Freidson place particular emphasis on the importance of research. Expanding the BOK through research is seen as an essential means of defending and expanding the profession's jurisdiction. There is a well-documented tendency for professional knowledge to become commodified over time (Abbott 1988, p. 146). For example, in civil engineering, classical methods of structural analysis have been largely absorbed into modern computer software tools. Commodification always results in a corresponding loss of professional work. Research is vital for replacing these losses with new knowledge and skills.

In the civil engineering community, research is sometimes portrayed as being independent of, or even contrary to, the Policy 465 initiative. The published civil engineering BOK says relatively little about research. However, the sociology of professions suggests that research should be fully incorporated into the initiative as a driver for ensuring the long-term vitality of the BOK.

The ideal-typical model also emphasizes the critical role that education plays in developing students' professional identities and values. This role is reflected in ASCE's strong support of student activities and in the inclusion of an outcome relating to attitudes in the civil engineering BOK.

Tension between Educators and Practitioners

Tension between educators and practitioners has been evident in many of the deliberations associated with the Raise the Bar initiative. Some practitioners have claimed that educators are out of touch with the needs of the profession, that engineering curricula do not provide graduates with the practical skills required for practice, and that educators focus too heavily on research. Gordon (2007), a prominent practitioner, writes that "engineering education must get real" and that "those who can, do, and those who can't, teach." Educators respond that many practical skills are best learned through experience, that practitioners must do more to impart these skills, and that forcing educational institutions to teach professional practice topics only dilutes the quality of a technical education. Krause (1999, p. 61) suggests that excessive corporate influence over engineering curricula is weakening the profession. The tone of these discussions might lead one to believe that these issues are unique to engineering. In reality, sociologists tell us that such tensions between educators and practitioners are intrinsic to professionalism.

In all professions, the importance of abstract theory in the BOK is often contested by practitioners, "who chafe under the authority claimed by theorists who do not have to dirty their hands with reality" (Freidson 2001, pp. 153–154). Yet, as we have seen, the abstract character of the BOK is critical to the strength of a profession.

Furthermore, "practitioners are likely to resent the intellectual authority of the faculty," in part because of the faculty's insulation from the everyday compromises and improvisations required of practitioners working in a world of incomplete information and finite resources (Freidson 2001, p. 100). This resentment notwithstanding, the relatively insulated position of the faculty outside of the labor market is essential for professionalism because it allows educators to focus on systematizing, refining, and expanding the BOK over which the profession claims jurisdiction. This focus provides the profession with the capacity to innovate and adapt in response to technological change and society's increasing expectations. As portions of the BOK become obsolete over time, the faculty must be equipped to expand the jurisdiction into new areas to ensure the profession's long-term viability.

Although faculty in all disciplines tend to resent the imposition of "soft skills" and professional practice topics in the curriculum, these subjects can provide context for enhanced discretionary decision making and need not detract from the technical content of a professional education, as discussed previously.

It appears, then, that tension between educators and practitioners often arises from claims that are largely without merit. Although we may lessen this tension through better communication, we must also accept it as a fundamental aspect of the professional landscape.

Differentiation within the Profession

Although Abbott's system of professions is concerned primarily with interactions between professions, jurisdictional disputes can occur within a profession as well. The continual expansion of knowledge and the invention of new skills often results in differentiation within a professional jurisdiction. The most common form of differentiation is termed *division of labor*. It occurs when segments of a professional BOK gradually become defined as specialties, and the associated specialists attempt to gain exclusive control over the specialty jurisdiction. Such specialty jurisdictions may remain within the parent profession (they often develop special education requirements and certification programs), or they may break away to form new professions. For example, in the nineteenth century, most architects did their own engineering. But as the process of designing buildings became more complex, it was necessary for the architects to effect a division of labor with civil engineers (Abbott 1988, p. 73). In 1952, sanitary engineers associated with ASCE's Committee for the Advancement of Sanitary Engineering initiated a process that ultimately resulted in the establishment of an independent professional society, the American Academy of Environmental Engineers in 1967 (AAEE 2009). Today this same trend can be seen in the establishment of ASCE's eight technical specialty institutes (ASCE 2009).

Because of this natural tendency toward division, a mature profession generally cannot be regarded as a single community of interest. Rather, it is a highly differentiated collection of subcommunities, which may hold contradictory policy positions. Thus, the ability of a professional society to effect strategic reform across an entire profession is highly constrained. For example, in recent years, the National Council of Structural Engineers Associations (NCSEA) has advocated a specialized baccalaureate-level curriculum in structural engineering (NCSEA 2006) even as ASCE has promoted technical specialization at the master's level.

Freidson suggests that such conflicts are inevitable and that conflicting policy positions must be considered legitimate, as long as they are based on professional criteria. Thus, ASCE must continue to accommodate conflicting viewpoints within the community and advance its agenda through persuasion and collaboration.

Another way that internal jurisdictional disputes can be resolved within a profession is by client differentiation, with professionals assuming responsibility for elite clients and nonprofessionals servicing lower-level clients or customers (Abbott 1988, p. 77). This trend is evident in the U.S. construction industry today. Civil engineers typically lead the design of heavy construction projects, but they are subordinate to architects in commercial building design and have been largely replaced by nonprofessional builders in residential construction. Abbott warns that the legitimacy of a profession will be compromised if the general public becomes aware of client differentiation. Because the general public is well aware of engineers' noninvolvement in residential construction, this form of client differentiation could be a contributor to civil engineers' lack of public prestige.

Role and Status of Paraprofessionals

As discussed previously, the ideal-typical profession establishes demanding standards for education and credentialing to ensure high standards of performance, limit the supply of practitioners, and preserve its labor market shelter. Restricting entry can be problematic, however, in times of increased demand on the profession or reduced supply of practitioners. Under these circumstances, the profession may be unable to meet its workload and, consequently, its jurisdiction may be vulnerable to claims by other occupational groups. To guard against this vulnerability, professions typically create subordinate groups that are capable of handling "dangerously routine" professional work (Abbott 1988, p. 72). These subordinate groups are generally called *paraprofessionals*. In civil engineering, paraprofessionals are further differentiated as *technologists*, who are typically graduates of four-year Technology Accreditation Commission (TAC)–accredited degree programs, and *technicians*, who are graduates of education or training programs no more than two years in duration [ASCE Paraprofessional Exploratory Task Committee (PETC) 2008].

It is evident that paraprofessionals, and technologists in particular, will be critical to the successful implementation of ASCE Policy 465. As the academic prerequisite for licensure is increased, the supply of licensed professionals can reasonably be expected to decrease, at least initially. A smaller number of better-educated professionals will necessarily be engaged in the profession's most demanding work—tasks requiring a high degree of discretionary judgment. But the remaining work, more routine and less rigorous, will need to be accomplished by increased numbers of well-qualified technologists.

Their important function notwithstanding, paraprofessionals' position in the labor force tends to be both ambiguous and unstable (Freidson 2001, p. 90). Some paraprofessionals, such as nurses, exercise considerable control over their work, but most are subordinate to professionals or lay managers. Some require a credential; others do not. Over time, some may advance to professional status; indeed, paraprofessionals often seek to blur the distinction between professionals and paraprofessionals as a way to facilitate upward mobility (Abbott 1988, p. 66). But many other paraprofessionals are made obsolete by new technologies or are downgraded to the status of semiskilled workers. This tendency toward obsolescence results primarily from the relative lack of abstraction in the paraprofessionals' BOK, and it causes the paraprofessionals' position in the work force to be inherently vulnerable, no matter how valuable their current work may be.

Given this vulnerability, it is not surprising that members of the civil engineering technology community have expressed concern with the implementation of Policy 465. In particular, some U.S.

states currently permit graduates of four-year engineering technology programs to attain professional registration, and there is significant concern that the Raise the Bar initiative may constrain this path to licensure in the future. There is also a broader concern that the technology community's role in the initiative has not been fully defined and that its interests have not been adequately addressed.

In 2008, ASCE responded to these concerns by forming the PETC. The committee made substantial progress toward clarifying the roles of civil engineering technologists and technicians. In its final report, the PETC also recommended (1) credentialing for engineering paraprofessionals; (2) better recognition and communication of paraprofessionals' contributions; and (3) better opportunities for paraprofessionals to participate in professional societies (ASCE PETC 2008). As a follow-up to these recommendations, ASCE has formed a new Paraprofessional Task Committee, which is developing recommendations to improve the utilization, recognition, and support of civil engineering paraprofessionals.

In the context of the sociology of professions, ASCE's ongoing efforts to define a distinct, valued, and clearly subordinate role for technologists is well founded. As Abbott (1988, p. 72) suggests, failure to institutionalize the subordination of paraprofessionals publicly and legally can increase a profession's vulnerability. Thus, providing paths for civil engineering technologists to attain professional licensure could weaken the profession unless provisions are made to ensure that the full professional BOK is attained before the credential is awarded. Technologists who attain professional licensure are no longer paraprofessionals—they are professionals and thus should meet professional standards. From this perspective, the PETC's recommendation for paraprofessional credentialing is particularly valuable. An appropriate credential would provide recognition, distinct from licensure, to which technologists could aspire; this recognition would be based on educational and experiential qualifications that technologists could reasonably expect to achieve.

To some extent, the issue of technologists attaining professional licensure is complicated by the licensing exam itself. The most fundamental distinction between a professional and a paraprofessional is the professional's need to exercise discretionary judgment with respect to a body of abstract knowledge. But the current engineering licensing exam tends to emphasize relatively routine application of current code specifications, rather than the exercise of discretionary judgment. In this sense, the current licensing exam may be inadequate as a standard for practice at the professional level.

Implications of Ideology

Freidson's model identifies a *professional ideology* as one of the five principal characteristics of an ideal-typical profession. Because a profession can only exercise power through persuasion, ideology is a critically important tool for justifying the profession's privileged position in an economic system and for opposing the ideologies of the free market and the bureaucracy.

The ideology of an ideal-typical profession includes the following assertions:

- Professional work is intrinsically gratifying because it is interesting, challenging, and discretionary in nature. Compensation is not the professional's principal motivation for work. (This ideology is contrasted with free markets, in which work is inherently unpleasant, and people work only to make money; and bureaucracies, in which people work to maintain their positions in the firm.)
- Professional work requires the exercise of discretionary judgment in response to unique problems. Standardized solutions are not possible for the types of problems that professionals are called upon to solve.
- Professional work involves the application of esoteric concepts that are not easily understood by the consumer and are too complex to be managed by those who have only general knowledge.
- Professionalism entails service, not only to a client, but also to transcendent values. Service to transcendent values may require the professional to act against the immediate interests of the client, thus implying a certain independence of judgment rather than mere faithful service.

Freidson notes that medicine, law, and the clergy have attained the strongest public status as professions, in part because of their close association with the transcendent values of health, justice, and salvation. By contrast, the ideology of engineering is weak because "the only distinctive value to which the tasks of engineering can be attached is *efficiency*" (Freidson 2001, p. 171). Efficiency can only be a means to an end, and the outcome of an efficient process might just as easily be evil as good.

From the ideological perspective, civil engineers can certainly claim a close association with the transcendent values of public safety and quality of life. Indeed, ASCE has long emphasized the profession's contributions in these areas. Yet the profession's inability to gain broad public awareness of its association with these transcendent values remains problematic.

More recently, formal incorporation of sustainability into the civil engineering BOK represents the potential for further ideological gains. Sustainability is clearly associated with the well-being and long-term survival of humanity—a transcendent value of considerable appeal. It remains to be seen, however, whether the linkage between civil engineering and sustainability can be firmly established in the public mind.

Another important ideological dimension of the Policy 465 initiative is its leaders' refusal to associate higher professional standards with increased compensation for civil engineering professionals. This refusal is consistent with the ideological assertion that professionals are motivated primarily by the intrinsically interesting nature of their work. As Freidson demonstrates, a public perception that professional work is being done for economic self-interest can have a highly corrosive effect on the strength of the profession.

Role of Public Image

Public image is an important source of a profession's strength and, particularly in the United States, has often been decisive in establishing jurisdictional control. Indeed, professional jurisdictions are normally claimed and won in the public arena long before they are institutionalized in law (Abbott 1988, p. 70). A particularly interesting example can be seen in physicians' recent success in defining children's behavioral problems as a medical disease—hyperactivity—and then exerting jurisdictional control over it. This claim was won almost entirely in the public arena. Conversely, engineers' persistent inability to establish a clear, compelling public image is cited as another source of the engineering profession's inherent weakness (Freidson 2001, p. 168).

It follows, then, that ASCE's Raise the Bar initiative cannot be advanced solely within the professional and legislative communities. It is at least as important for enhanced professional standards to be sold to the general public through a comprehensive public information campaign.

Assault on Professionalism

Freidson (2001) and Krause (1999) describe an ongoing assault on professionalism, characterized by trends toward eliminating or weakening professional market shelters and standardizing professional work under the control of bureaucratic organizations. If these trends continue, Freidson predicts that

- Many tasks currently performed by professionals will be done by less-qualified workers;
- Many professional positions will be transformed into paraprofessional or nonprofessional positions;
- Expert knowledge will become increasingly commodified;
- Employing organizations will continue to standardize professional work to reduce costs and better control their workforces;
- Legal requirements for licensure will be relaxed or eliminated; and
- Within professional schools, curricula will face ever-greater demands for practical training, aimed at preparing students to perform specific tasks required in the workplace.

Many of these trends can be seen in the engineering profession today. Over time, design codes have become larger, more numerous, and increasingly prescriptive—in effect, substituting code specifications for the engineer's discretionary judgment. Recently, the governor of West Virginia proposed legislation that would allow state agencies to award engineering design contracts on the basis of competitive bids (Messina 2009). In 2008, the New York City Council eliminated the city's requirement that the commissioner of the Department of Buildings be a licensed engineer or architect. That same year, Nebraska initiated legislation to remove the requirement for the director of the Department of Natural Resources to be a licensed engineer. Despite the catastrophic collapse of the I-35 bridge in Minneapolis in 2007, state legislation that would require the deputy commissioner and chief engineer of the Minnesota Department of Transportation to be registered professional engineers is currently stalled (Boykin 2009). On the academic front, a recent report by the Carnegie Foundation for the Advancement of Teaching criticized engineering schools for "putting theory before practice" (Sheppard 2008)—a well-meaning criticism that inadvertently undermines the abstract theoretical basis for a strong professional BOK.

As Freidson suggests, the most important consequence of these deprofessionalizing trends will be a long-term decline in the quality of professional work because of reduced discretion, increased standardization, reduced job satisfaction among practitioners, and constraints on the development of new knowledge. Deprofessionalization will also weaken engineering ethics because only licensed professionals are subject to legally enforceable codes of ethics. For these reasons, above all, ASCE's ongoing efforts to strengthen the profession are imperative.

Conclusions

The analysis outlined previously yields the following three major conclusions:

- The sociological theories of Abbott and Freidson regarding professionalism are highly applicable to civil engineering. Most, if not all, of the significant challenges associated with Policy 465 implementation are addressed and informed by these theories. Many of the problems at which the initiative is aimed were well characterized by Abbott and Freidson long before they were articulated by ASCE. Thus, these models have great utility as an organizing framework for future efforts to advance the profession.
- In the context of ideal-typical professionalism, engineering is inherently weak. This weakness results from the nature of the discipline, the organizational context in which engineering work is usually performed, the exactness of the engineering BOK, and an ideology that can only claim efficiency as a transcendent value. For a variety of reasons, however, civil engineering appears to be an exception to this rule. As a result of its unique organizational context, its strong association with licensure, and the one-of-a-kind nature of its projects, civil engineering exhibits considerably greater consistency with ideal-typical professionalism than do most other engineering disciplines.
- With few exceptions, the Policy 465 initiative has tended to strengthen the civil engineering profession by moving it toward greater consistency with the ideal-typical model.

Recommendations

Specific recommendations for the future direction of Policy 465 implementation are provided subsequently. These recommendations do not reflect the author's opinions; rather, they derive logically and objectively from the foregoing analysis. Therefore, they describe actions that will strengthen the civil engineering profession by bringing it toward greater consistency with the Freidson's ideal-typical model. The recommendations are as follows:

- The published civil engineering BOK should remain a dynamic entity; thus, ASCE must be willing to continually update and refine it.
- The civil engineering BOK's enhanced emphasis on theoretical subjects (math, natural science, and engineering science), on master's-level technical specialization, on risk and uncertainty, and on inclusion of humanities and social sciences are sources of strength and should be preserved.
- Future editions of the published civil engineering BOK should emphasize the importance of university-based research in ensuring the vitality of the BOK.
- ASCE should continue using modifications to the ABET accreditation criteria as a mechanism for enhancing educational fulfillment of the BOK.
- ASCE's emphasis on professional licensure in general, and its ongoing efforts to raise licensure standards in particular, are critical to the strength of the profession and must be continued. The society should oppose industrial exemptions, which allow the practice of engineering without a professional license.
- ASCE should be prepared to proceed with the Raise the Bar initiative without the cooperation of other engineering societies, if necessary. The vast differences between the engineering disciplines and, in particular, the tendency of the manufacturing-oriented engineering disciplines toward bureaucratic control of their work will hinder long-term collaborative efforts to strengthen the engineering profession as a whole.
- On the other hand, it is critically important for ASCE to maintain strong collaborative relationships with professional organizations representing civil engineering subdisciplines (e.g., American Water Works Association, Institute of Transportation Engineers) and closely related engineering disciplines (e.g., American Academy of Environmental Engineers). Because these organizations are engaged in similar work and are similarly committed to professional licensure, their goals are more likely to be consistent with ASCE's goals.
- ASCE should continue to promote dialogue with its technical institutes over the future of the profession, recognizing that differentiation and disagreement over policy positions are inherent in professional organizations.

- ASCE should continue its efforts to define a distinct, valued, and clearly subordinate role for technologists. Separate credentialing of technologists would greatly enhance these efforts. The society should oppose any path to professional licensure that bypasses attainment of the professional BOK. The society should encourage NCEES to modify the engineering licensing exam to place more emphasis on the exercise of discretionary judgment with respect to abstract concepts and theories.
- ASCE should continue its strong emphasis on student activities as a mechanism for developing the professional identity of future engineers.
- ASCE's longstanding emphasis on the profession's role in enhancing public health, safety, welfare, and quality of life is appropriate from an ideological perspective. Efforts to strengthen this linkage in the public mind are imperative.
- The BOK's emphasis on sustainability represents an opportunity to greatly enhance the ideology of the civil engineering profession by associating its work with a transcendent value that is of considerable concern to society.
- ASCE should continue to pursue the Raise the Bar initiative without reference to its effect on monetary compensation for engineering professionals. To preserve the ideology of professionalism, economic gain must be viewed as secondary to the intrinsic satisfaction of professional work.
- ASCE should engage in a comprehensive public information campaign aimed at convincing all stakeholders, including the general public, that enhanced standards for engineering licensure will serve the public interest.
- Given their power, coherence, and broad applicability, the sociological models of professionalism by Abbott and Freidson should be used to guide the future strategic direction of the civil engineering profession.

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