Institutional Integrity:

Perceptions of Organizational Legitimacy and Organizational Virtuousness in a Research University Setting

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ABSTRACT

This study examines approaches to managing problems in research by exploring the external factors and internal organizational characteristics that shape the integrity of research at a research university. Two theoretical constructs, organizational legitimacy and organizational virtuousness, frame this analysis of systems, methods, and activities used to ensure integrity at a research university, and explore connections between them. This study is based on twenty interviews with research leaders and faculty researchers in two colleges, one representing an applied research discipline and the other a basic science discipline, at a public research-intensive university. Findings suggest that systems and mechanisms created to ensure organizational legitimacy (public trust, confidence, social responsibility) in research are fundamental to the survival of a research university, in that they convey credibility to external stakeholders. Findings also suggest that the virtues of collegiality, integrity, openness, trust, and purpose are aspirational characteristics of a desirable research environment, and organizations can promote or hinder these characteristics through formal and informal processes. Finally, the interviews indicate that university leaders see connections but not exact alignment between the actions taken to achieve organizational legitimacy and the actions taken to promote organizational virtuousness.

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CHAPTER 1

INTRODUCTION

Integrity in research is a commitment to the core values of rigor, honesty, fairness, openness, and transparency in the designing, planning, conducting, and reporting of research by the individuals and institutions who conduct and advance research. According to a recent report lead by the National Academies of Sciences, Engineering, and Medicine (2017), "Integrity in science means that the organizations in which research is conducted encourage those involved to exemplify these values in every step of the research process." These overarching principles have remained relatively unchanged over time, but how they are interpreted, applied, and supported on a daily basis is where ambiguity lies and details matter. The research enterprise is undergoing rapid transformation. Increased expectations of researchers, acknowledgement and quantification of questionable practices, and a growing body of evidence indicating problems of reproducibility call for a "need for more visible, explicit mechanisms to ensure integrity in the research process" (National Academy of Sciences, National Academy of Engineering, 1992, p. 2). This sentiment is now stronger than ever, and the scientific community is beginning to collectively call for a re-thinking of the fundamental features of the research ecosystem in order to confront and address the growing complexities and flaws of the system (Alberts, Kirschner, Tilghman, & Varmus, 2014).

A recent article in the *New York Times Magazine* detailing the rise and fall of social psychologist Amy Cuddy reflects the current landscape of uncertainty for

researchers who find themselves in uncharted territory, defending practices and decision-making that were once considered common and justifiable (Dominus, 2017). Cuddy rose to public and professional prominence with a study that found that if a person stands in a "power pose" position (arms outstretched above their head) for two minutes, he or she would gain confidence in the immediate situation, as defined by higher testosterone and lower cortisol levels (Dominus, 2017). Cuddy's research led to an enormously successful TED talk, a book deal, and a prestigious academic appointment at Harvard University. Then scientists began to re-examine and question her work. Attempts to replicate Cuddy's findings highlighted small decision-making transgressions and "cajoling" of data in order to extract the most useful results, data practices that had been considered routine by many scientists in her field and in many other disciplines. Some believe that Cuddy was targeted and made an example of by other scientists because of the professional and financial success she enjoyed, while others point to this case as one very public example of a much larger threat to the integrity of the research enterprise.

Lack of integrity and misbehavior in research were not formally recognized as significant problems in the United States and globally until the late 1970's. Media coverage on this topic has largely focused on elaborate and clear-cut cases of scientific fraud, like British medical researcher Andrew Wakefield's fabricated connection between vaccines and autism spectrum disorder, Duke University professor Anil Potti's fake data on cancer treatments, and respected Dutch psychologist Diederick Stapel's decades-long data fabrication scheme. Approaches to managing and promoting integrity have typically emphasized detection and deterrence of these types of extreme cases of misconduct,

narrowly defined as fabrication, falsification, or plagiarism (FFP); however, the more prevalent, less egregious offenses like those characterized in the Cuddy case (e.g. selective data reporting, significance mining, concealing conflicts of interest), may be more damaging to the scientific enterprise (Fanelli, Kerridge, Hill, McNeill, & Doran, 2009; John, Loewenstein, & Prelec, 2012; Martinson, Anderson, & De Vries, 2005).

While Cuddy's case does not involve fraudulent data, plagiarism, or glaring dishonesty, nor does it reflect behavior that would have been considered egregious among her colleagues less than a decade ago, it is one that demonstrates the need for greater awareness and agreement about practices that constitute responsible and irresponsible behavior in research. On a larger scale, it highlights the need for fuller understanding of the external, organizational, and environmental factors that influence the integrity of research and collective approaches to promote and ensure this commitment.

Background

The research enterprise is a complex system with billions of dollars, public and private, invested in organizations and individuals propelling this rapid advancement of knowledge, and it is becoming increasingly complex with this modern age in research that values global and interdisciplinary collaborations, use of new technologies, greater media attention, and overall heightened expectations for investigators to address societal challenges (National Academies of Sciences, 2017). The tenets of trust, freedom, and responsibility are implicit underpinnings in the pursuit, creation, and dissemination of

knowledge and are critical to the overall progress and permanence of the enterprise. Within the framework of these core tenets, the scientific community is bound by a set of common principles and standards that guide daily decision-making and conduct of researchers and strengthen the enterprise. Commitment to these principles and standards reflects the concept of integrity in research.

Trust, Freedom, and Responsibility

Trust, freedom, and responsibility are the core tenets and principles critical to the functioning of a robust research system. The progress and stability of the enterprise hinges on trust at all levels (individuals, institutions, scientific community, funders, government, and the public) and is dependent upon "relationships that require its constituents to fulfill their responsibilities in order to be effective" (National Academies of Sciences, 2017, p. 12). Within the scientific community, a foundation of knowledge has been developed through a cumulative process that relies on researchers' trust of each other to produce results that lead to the next pathway of inquiry and advancement (Bird, 1994; National Academies of Sciences, 2017). *On Being a Scientist* (2009), an influential report and the premier document for instruction on responsible research, underscores the critical nature of trust within the scientific community and among the public as foundational:

> The scientific enterprise is built on a foundation of trust. Society trusts that scientific research results are an honest and accurate reflection of a researcher's work. Researchers equally trust that their colleagues have gathered data carefully, have used appropriate analytical and statistical techniques, have reported their

results accurately, and have treated the work of other researchers with respect (National Academies of Science, Engineering, 2009, p. ix).

Scientists also value and desire an environment characterized by freedom to conduct research, and the public assumes that a high standard of integrity exists within the research environment and in the academic research community. Academic freedom, a central element in what is perceived as a favorable and supportive research culture among faculty and investigators at a university, represents the ability to conduct research, teach, publish, speak, and pursue knowledge and discovery with little restriction (Altbach, 2011). Scientific freedom, applied mainly in the natural sciences, is the principle of free inquiry for its own sake—the ability to pursue truth in science as an end in and of itself (Goodchild, 2007).

A more recent interpretation of scientific freedom adopted by the American Association for the Advancement of Science (AAAS) suggests there are special responsibilities that correspond to the notion of free inquiry for scientists "to extend and disseminate knowledge for the good of humanity" (Committee on Scientific Freedom and Responsibility, 1997, para. 1). The Board of the AAAS adopted a statement on scientific freedom and responsibility in October of 2017, further articulating the necessity of the two core values functioning in tandem. The statement reads in part, "Scientific freedom is the freedom to engage in scientific inquiry, pursue and apply knowledge, and communicate openly. This freedom is inextricably linked to and must be exercised in accordance with scientific responsibility" (Jarvis, 2017, p. 462).

Research integrity is often understood in the context of characteristics of both individual researchers and the environments in which they operate (Denecke, Kent, Allum, & Council of Graduate Schools, 2012). In its broadest sense, integrity in research is a commitment to honesty, objectivity, information sharing, professional accountability in practice, and acknowledgement of both the limitations of discovery and contributions of others among the scientific community. According to Resnik (2015), this commitment is supported by shared principles and standards intended to promote the goal of truth, minimize error, ensure accountability to the public, build public support, promote moral and social values, strengthen values that are essential for collaborative work, and promote the use and acceptance of research beyond the walls of academia.

A narrow perspective on research integrity places it in a rule-abiding context, defining it interchangeably with the term "responsible conduct of research" (RCR). According to Kalichman (2013), this term is often used to describe the "basic responsibilities of researchers to not lie, cheat, or steal" (p. 381) or more formally, according to Resnik (2015), the state of being in compliance with the rules and mandates of regulatory bodies. According to Kalichman (2007), the term "responsible conduct of research" originated in the National Institutes of Health and has been accepted into common use, but "continues to defy definition" (p. 870). Pennock (2015) write that the RCR literature is focused on rule-breaking and rule-following and this compliance-centered perspective of integrity is often framed in a legalistic manner that focuses on deterrence of misconduct and misbehavior (i.e. what not to do) rather than desirable conduct in research. While a rules-based, systemic approach may be a necessary way for

institutions to deal with undesirable behavior, this perspective on integrity does not necessarily take into account moral beliefs, values, and attitudes or the influence of cultural dynamics in the research environment.

The Institute of Medicine's (IOM) 2002 report on research integrity reflects not only the conduct of individual researchers but also recognizes the importance of the research environment. In addition to the personal-responsibility and rigor-centered components that include individual honesty and accuracy in proposing, planning, performing, reporting and representing of research, the IOM's definition of integrity includes fairness in peer review, collegiality and sharing of information resources among scientists, disclosure of conflicts of interest, protection of human subjects, and adherence to the mutual responsibilities between investigators and research teams (Institute of Medicine & National Research Council, 2002). According to the IOM (2002), "Integrity in research embraces the aspirational standards of scientific conduct rather than simply the avoidance of questionable practices" (p. 115). Though government administrative rules and oversight may be important, they represent "the floor of expected behavior" (Institute of Medicine & National Research Council, 2002, p. 34).

The IOM definition goes further in emphasizing environmental influences on researcher conduct and calls on institutions to embrace excellence and trustworthiness from an organizational standpoint and to fulfill their obligation to create supportive environments that promote the moral values and practices expected from researchers. They recommend the following to foster a culture of integrity: leadership that supports responsible conduct, encouragement of respect for the research enterprise, promotion of

productive interactions between trainees and mentors, communication of and advocacy for institutional rules and policies, management of institutional conflicts of interest, fair and thorough inquiries of misconduct when necessary, educational opportunities promoting responsible practices, and continued assessment of institutional environmental supports (Institute of Medicine & National Research Council, 2002).

Theoretical Perspectives

A research university, through its policies, systems, people, and organizational culture, arguably has great power to influence research environments. Institutions support investigators and the research process in multiple ways, but there has been little exploration of the relationship between the internal culture, characteristics, and properties of an organization and the externally required activities and actions taken by the institution to ensure responsible research. A shift from the federal government's emphasis on oversight and compliance to institutional approaches that promote supportive and ethical research environments is desirable but, as yet, not fully articulated. Further research is needed to determine how policies, systems, oversight mechanisms and general education relate to the daily work that takes place in the research environment.

For this study, two theoretical perspectives representing the actions, features, and properties of a research university are used to explore perceived connections and mutual influence of the external rules of research and the internal properties of integrity. The formal rules and systems are represented through a theoretical construct known as organizational legitimacy, defined for the proposed study as the actions required of research universities to achieve public trust and confidence in research among external

parties. A “culture of integrity” is explored through a lens of organizational virtuousness, defined in terms of internal organizational elements of purpose, trust, collegiality, integrity, and openness and the corresponding positive practices that support these traits that exist within an organizational environment.

Organizational legitimacy, a theory that derives from aspects of institutional, managerial, technical and stakeholder theories, can explain the disclosure of information by an organization, in combination with formal activities taken, to maintain compliance of socially constructed norms and values (Burlea Schiopoiu & Popa, 2013). Formal structures exist as a product of the networks and activities within the organization, but also, particularly for institutions with social obligations, as the policies, laws, programs, procedures, and positions manifested and enforced by public opinion (Meyer & Rowan, 1977). As new social and environmental challenges and expectations arise with respect to organizations and those conducting the work within these formalized institutions, more rules and structures emerge as a means to prove adherence to expectations and fulfillment of a social contract. The evolving desires and expectations of research stakeholders for knowledge production to be of global significance, interdisciplinary in nature, and relevant to societal challenges underscore the necessity for a research university to maintain legitimacy. As the prevailing social contract between science and society continues to evolve, expectations for socially robust research have heightened, imposing more legitimizing systems on research institutions (Gibbons, 1999).

Organizational virtuousness is a term established by Cameron et al. (2004) to emphasize the positive elements in an organization that are used to improve performance

and achieve moral excellence. According to Cameron et al. (2004), "Virtuousness is associated with what individuals and organizations aspire to be when they are their very best" (p. 767). In the study of organizations, virtuousness is often replaced with terms like corporate social responsibility, business ethics, employee morale, and citizenship behavior (Cameron et al., 2004). Studies on organizational virtuousness have been linked empirically to performance and productivity and positive organizational-behavior measures like employee commitment, satisfaction, and motivation (Cameron & Mcnaughtan, 2014; Cameron et al., 2004; Cameron & Winn, 2012). Virtuousness, in the context of the research environment, translates to organizational traits such as purpose, trust, collegiality, integrity, and openness and practices that foster these features in the organization. For this study, a measure of organizational virtuousness is used to represent the internal properties of an organization and perceptions of these properties among organizational research actors.

Research Question

The theoretical perspectives of organizational legitimacy and organizational virtuousness frame this analysis of systems and methods used to foster integrity at research universities. The purpose of the study is twofold: to explore how researchers and administrators think about organizational legitimacy and virtuousness, and to explore whether or not they perceive connections between them. The following research question is the basis for the study: *How do researchers' and administrators' perceptions of the formal actions taken by a research university to achieve organizational legitimacy relate*

to their perceptions of the factors that represent organizational virtuousness in research environments at the institution?

Methodological Summary

A qualitative research design was used to collect data through semi-structured interviews. Faculty participants with varying roles and levels of experience in research at a public land-grant research university were recruited to take part in the study. The term "research actors" for this study means faculty researchers, department chairs, division heads, deans, associate deans, and vice presidents who are actively involved in the research process at a university. One-hour interviews were conducted to examine insights and attitudes about formal activities and other aspects of the institution that emphasize public trust and integrity, as well as perceptions about virtuous characteristics and practices within the organization and research environment that are associated with positive outcomes. Specifically, interviewees were asked about their perceptions about external views of the organization related to responsible conduct of research and how activities and systems interact with these views, as well as perceptions on the prevalence of virtuous characteristics in their immediate research environments and the ways in which these traits are or are not carried out in practice.

Chapter 2 presents a review of current and past literature on research integrity, with emphasis on approaches used to manage integrity and the growing body of literature on the ways individuals are influenced by elements and conditions of their environment. Chapter 2 concludes with an overview of the literature on the two theoretical constructs,

organizational legitimacy and organizational virtuousness, used to frame this study. Chapter 3 describes the conceptual framework and methodology, detailing the design and procedures used to support analysis of the data. Chapter 4 summarizes findings from 20 interviews with research actors at the university, grouping them into common themes by question. Finally, Chapter 5 discusses the findings, outlines conclusions, and presents implications for theory and practice and directions for future research.

CHAPTER 2

REVIEW OF THE LITERATURE

Research is rapidly transforming society. Advances in science and technology offer endless possibilities for quality-of-life improvements and for new pathways to address social issues. As noted in a recent report of the National Academies of Sciences, Engineering, and Medicine titled *Fostering Integrity in Research,* "The achievements of science in formulating a systematic knowledge of the physical, biological, and social world have been breathtaking" (National Academies of Sciences, 2017, p. 11). According to Korenman (2006), "Societal dependence on science conveys on scientists a great ethical responsibility to conduct research with integrity" (p.2). Bird (2014) claims that the responsibilities of researchers involve a broader "unwritten, unexpressed," social contract that goes beyond the expectation of a "high quality product" (sec. Social Responsibility). The public must trust and respect the individuals, institutions, and systems that produce and support knowledge advancements in order for scientists to fulfill this societal commitment.

Threats to the Enterprise

There is a wide range of ethical ambiguity inherent in science, as it is a dynamic, human-centered enterprise that is reliant on cumulative efforts of an expansive community. A substantial proportion of the literature on research integrity is focused on the individual level and emphasizes its critical nature in the context of misconduct or

misbehavior of individuals (Braxton, 1999; Davis, Riske-Morris, & Diaz, 2007; DuBois et al., 2013; Michalek, Hutson, Wicher, & Trump, 2010; Titus, Wells, & Rhoades, 2008). According to Bird (1994), falsifying, fabricating, or plagiarizing data are universally regarded as unacceptable. Less clear, but also a source of potential issues, are authorship allocation, data interpretation, methodological decisions, financial compensation, and human and animal subject use, as well as ethical issues that are distinct to a field (Bird, 1994). As a result, the potential consequences of irresponsible or detrimental research are difficult to quantify and have the potential to extend far beyond the limited scope of a single study or researcher in question.

Research misconduct is defined formally by the federal government as fabrication, falsification, or plagiarism (FFP) in proposing, performing, or reviewing research, or in reporting research results (Office of Research Integrity, n.d.). Research misconduct did not surface as a public issue until the late 1970s and was discussed very little in any context prior to that time (Steneck, 1994, 2006). According to Shamoo and Resnick (2015), the evidence about the rate of misconduct among researchers is inconclusive and varied, though it is estimated to be as low as .01 percent (confirmed cases of federally funded research) and as high as 1 percent of researchers per year (anonymous self-reports of misconduct). Early reports attempting to quantify misconduct on a national scale estimate between 40 to 100 cases in total from 1980 to 1990, but from 1989 to 1991, more than 200 allegations were made to U.S. government offices, resulting in approximately 30 confirmed findings of misconduct (Institue of Medicine, National Academy of Sciences, National Academy of Engineering, 1992). According to the

National Academy of Sciences *Responsible Science* report (1992), this wide range reflects the many uncertainties present at that time about what constituted an official claim and standards of evidence for misconduct.

More recently, a study conducted by Titus et al. (2008) suggests that there is evidence that many incidents of misconduct go unreported to the federal Office of Research Integrity. A survey of more than 2,000 scientists revealed that 8.7 percent of respondents, totaling 192 scientists describing 265 incidents, indicated that they had observed or had direct evidence of research misconduct within the last three years, a seemingly much higher rate when compared to the national data from the Office of Research Integrity (Titus et al., 2008). According to Rhoades (1995), insufficient whistleblower protections are one possible explanation for high rates of underreporting. DuBois et al. (2013) found evidence that, even when reporting of misbehavior does occur, institutions have failed to respond effectively. One study estimates the cost to an institution to investigate and remediate a single case of misconduct to be $525,000, and an annual cost to U.S. institutions totaling more than $110 million (Michalek et al., 2010). This figure includes neither the long-term consequences for the institution in relation to funding agencies, research trainees, faculty investigators, patients and clients, and the public, nor the non-financial repercussions like loss of time and effects on related research lines.

More recent scholarship raises serious concern about detrimental, irresponsible, or questionable research practices that fall outside the narrow definition of misconduct, are considered less egregious, more difficult to detect, occur more frequently, and are viewed

as more acceptable in the research community (Fanelli et al., 2009; John et al., 2012; Martinson et al., 2005). Examples of detrimental practices include: subtle distortions of information, mining data to show significance, selectively publishing only certain results, concealing conflicts of interest, and other problematic behaviors that have the potential to greatly impact the direction of research and outcomes over time (Fanelli et al., 2009).

Efforts have been made to quantify questionable practices based on self-reports from scientists. Findings from a survey of more than 3,000 mid and early-career scientists exposed "a range of questionable practices that are striking in breadth and prevalence," including but not limited to: ignoring aspects of human-subjects research requirements, using another person's ideas without proper permission, failing to present data that contradict one's own research, and overlooking others' use of flawed data (Martinson et al., 2005, p. 737). Most noteworthy, 33 percent of respondents, by their own admission, reported engaging in at least one of the top ten identified detrimental behaviors, with a significantly higher proportional percentage (38 percent) for those identified as mid-career, than for early-career respondents (28 percent) (Martinson et al., 2005, p. 738). In a systematic meta-analysis of scientific misconduct, Fanelli (2009) found that 33.7 percent of scientists admitted to questionable practices beyond fabrication or modification of data at least once in their career and, when respondents were asked to report about the behaviors of their colleagues, the rate went up to 72 percent. Inherently ambiguous and individually defensible decisions in the everyday research environment can threaten the credibility of methods and results, prompting a sequence of questionable actions and potentially irreproducible results.

In an article titled, "Why Most Published Research Findings are False," Stanford University professor of medicine and statistician John Ioannidis claims most research findings cannot be replicated (Ioannidis, 2005). This article quickly became the most downloaded article in *PLOS Medicine* history and catalyzed another layer of concern in the discussion about questionable research practices (Freedman, 2010). Original research processes are now being examined more closely and have the potential to reveal insights and consequences about ambiguities in practices.

The debate about ambiguity of research practices outside the scope of federally defined misconduct is not new. The National Academy of Sciences first addressed this idea in their 1992 report *Responsible Science*, calling the lack of consensus about the "nature, acceptability, and damage that questionable practices cause" a serious problem for the scientific community and the research enterprise, but warned of the risks of regulatory bodies' prescribing research methods and practices to investigators, stating: "regulatory efforts to determine 'correct' research methods or analytical practices, without sustained participation by the research community, could encourage orthodoxy and rigidity in research practice and cause scientists to avoid novel or unconventional research paradigms" (1992, p. 87).

The Evolution of Approaches to Managing Integrity

The broader scientific community over time has come to understand that a vigorous and robust enterprise must not rely solely on implicit standards and traditions of investigators to ensure integrity. Initially, researchers relied on a self-regulatory system

of checks and balances in the research process to safeguard itself from misbehavior and fraud. When it became clear that there were cracks in the honor system threating the integrity of science, the community failed to come together to offer ways to strengthen the process from within, leading to external regulatory intervention, the issuance of formal guidelines for research practices, and the proliferation of education as methods to mitigate threats and manage the integrity of research. A more sophisticated view of ensuring integrity takes into account the multitude of potential influences in the local and external environment to the integrity of research and calls for exploration of approaches that protect and value intellectual independence while also holding all actors of the enterprise (investigators, institutions, sponsors, governments) accountable for responsibly and ethically carrying out their work.

A System of Self-Regulation

In the United States, the proliferation of scientific research funded by the federal government at universities began in earnest after World War II (Altbach, 2011; Goodchild, 2007). Physicist Vannevar Bush, who headed the U.S. Office of Scientific Research and Development authored an influential report titled *Science, the Endless Frontier,* emphasizing the notion that "Big Science" was the "Best Science" which led to the development of a complex system of competitive federal grants for universities or academic "experts" to carry out research on behalf of the government and, ultimately, the creation of the National Science Foundation (Thelin, 2011). This model of funding evolved into a more permanent mechanism that has made the federal government the largest funder of United States basic research since the early 1950s (Press, 2015; Thelin,

2011). As a result, unease and tension began to arise among faculty members who regarded this level of control and direction from the government as a fundamental conflict of interest that compromised the spirit of academic integrity and stifled academic freedom (Thelin, 2011).

Whereas concerns among faculty related to loss of academic rights and control of research pathways intensified, there appeared to be little to no discussion about the integrity of research practices in this era of expanding scientific exploration. Doctoral programs proliferated across the country with standards for student admission and completion, but dialogue was absent on the formal steps to ensure the responsible conduct of research among students and their faculty mentors and future research peers. Scholars of research integrity offer the explanation that scientists and university leaders saw themselves as a self-policing, self-regulatory population (Braxton, 1999; Lafollette, 2000; Steneck, 1994). Simply stated, research integrity was an unwritten, universally understood principle within the scientific community and future researchers were socialized to these ideals through the traditional mentor-apprentice model.

According to Steneck (1994), the most comprehensive analysis on the management of scientific conduct written before the 1980s was by sociologist Harriet Zuckerman. Zuckerman argued that the implicit social contract and norms in science were the heart of self-regulation and concluded, as competition in science increased, self-policing would also strengthen (Steneck, 1994). In other words, there will be scientists who make mistakes intentionally or unintentionally, but there will also be those devoted to checking and correcting. Between 1974 and 1981, however, several high profile cases

of scientific misconduct came to light at respected institutions, attracting significant public attention and unwanted scrutiny by the federal government, and threatened to tarnish the reputation of the enterprise (Lafollette, 2000; Price, 2013). According to Price (2013), the general sentiment among the scientific community during this era was that misconduct was a rare occurrence among deviants in the field and should not be tolerated, but that creating formal policies and standards of practice in response to these isolated situations would be superfluous.

As a result, much of the early literature on research integrity focused on extreme cases of misconduct and, according to Redman (2013), the scientific community characterized the types of individuals who committed these acts as "bad apples." According to Jasanoff (1993), this theory attributes fraud and unethical behavior to moral weakness and "uncontrollable ambitions" (p. S92) of individuals rather than recognition of situational, organizational, cultural, or environmental factors that may influence decision-making. Jasanoff (1993) claims that, for the scientific community, it was more palatable to confront the problem by critiquing a case and highlighting personality traits and mental deficiencies that could lead an individual to misconduct than to confront environmental and structural barriers in science that make it difficult to act with integrity. In her book on research misconduct policy in biomedicine, Redman (2013) claims, "Characterizing the problem and its solution with the 'bad apple' metaphor is ethically problematic; by casting blame almost exclusively on individual offenders, it holds institutions virtually harmless" (p.3).

Early investigations of misconduct took years to conclude but did not lead to acknowledgement of systemic problems among the scientific community (Jasanoff, 1993). In their 1987 article in *Nature* on the prominent case of John Darsee who had been caught fabricating data at Harvard Medical School, Stewart and Feder (1987) were among the first scientists to call attention to the idea that lapses in integrity standards may be more widespread than initially believed. They concluded, that while attention needs to be paid to this potential crisis and certain individuals in the community may be prone to abuse, a system of self-regulation is critical to discovery and the costs of outside regulation and interference in the standards of research practices far outweigh the benefits (Stewart & Feder, 1987). The general consensus among the scientific community during this time and even today is that scientific freedom and self-regulation are foundational to research and innovation. Scientists, laboratories, research institutions, departments, academic journals, and professional associations should not be bound by rules imposed from outside the research community; however, from the perspective of the federal government, the academic community was failing to recognize and respond to the changing landscape and problems in research, putting trust in the enterprise at risk (Braxton, 1999; Jasanoff, 1993; Lafollette, 2000).

Regulatory Intervention as a Response

According to Lafollette (2000), what distinguishes the United States' response to problems in research from other countries' is the extent of government involvement and emphasis on compliance. While the principles of research integrity articulate the aspirational norms of conduct (i.e. accuracy, transparency, honesty, fairness), approaches

to ensure these principles have been reactive in nature and grounded in rule-making to deter and detect misbehavior and bolster public trust (Yarborough, Fryer-Edwards, Geller, & Sharp, 2009). System-based approaches have been led by the federal government (Pascal, 1999; Price, 2013) and can generally be categorized in the following ways: development and expansion of policy mandates to institutions; creation of oversight mechanisms, and proliferation of RCR education guidelines and resources (Anderson & Adam, 2014).

Intense government scrutiny of the scientific enterprise began with a congressional hearing in 1981 titled Fraud in Biomedical Research, bringing integrity issues to light in the public domain, but doing little to provide universities with clear direction or guidance on how to investigate allegations of misconduct (Steneck, 1994). According to Lafollette (2000), earlier, institutions handled controversy and resolutions internally and quietly regardless of funding source. As more questionable cases emerged, several of which involved NIH funding at major research universities (Price, 2013; Steneck, 1994), public confidence and trust in scientific research began to weaken, not only in terms of the individual scientists, but also for the institutions that appeared to do little to ensure credibility (Tamot, Arsenieva, & Wright, 2013). Scholars conclude that beyond claiming the rarity of these circumstances and underscoring the necessity of self-regulation in science, institutions appeared paralyzed and unsure of how to respond to accusations, collect evidence, investigate, draw conclusions, and impose sanctions (Price, 2013; Steneck, 1994; Tamot et al., 2013).

Congress urged the scientific community in the early hearing process to take the lead and better articulate standards of practice and codes of conduct, but universities failed to make real progress and act in a coordinated way (Lafollette, 2000; Steneck, 1994). As a result, in 1985, Congress passed the Health Research Extension Act and subsequent legislation requiring universities to begin developing formal mechanisms to investigate and handle cases of research misconduct and report information to the federal government (Pascal, 1999; Steneck, 1994). During this time, professional societies and associations began making efforts to provide guidance on standards of conduct by hosting conferences and drafting reports, and the Association of American Universities issued a framework for universities on how to deal with research fraud (Association of American Universities, 1988). Debates about norms of conduct followed, further expanding the federal regulatory presence and creating an investigative process and compliance-based system that, according to Lafollette (2000), lacks the necessary support and spirit of cooperation from the community it seeks to both regulate and serve.

Approaches to managing integrity have since centered on federal mandates to institutions on misconduct policy and guidelines on the education for responsible conduct for investigators who are publicly funded. It was not until 1989 that the Public Health Service published a formal regulation, 42 CFR 50 Subpart A, defining misconduct in science specifically as “falsification, fabrication, plagiarism, or other practices that seriously deviate from those that are commonly accepted within the scientific community for proposing, conducting, or reporting research,” (United States Department of Health and Human Services & Office of Rearch Integrity, 1989). In 1992, another entity, the

Office of Research Integrity (ORI) of the Department of Health and Human Services was established to handle matters overseeing misconduct cases and to separate from the function of research funding, handled by the principal Public Health Service agency, the NIH (Pascal, 1999; Steneck, 1994).

The ORI established new administrative review processes for misconduct cases that standardized investigative procedures, hearings, and independent review of findings, but, according to Pascal (1999), failed to win the acceptance of the scientific community. The ORI attempted to work with institutions as a cooperative system by developing model policies and procedures to meet regulatory requirements, providing them to all Public Health Service funded institutions. Approximately 25 percent of the institutions adopted the model policies (Pascal, 1999).

Today, every institution that receives Public Health Service funding is required by the federal government to have policies and procedures in place for handling reports of misconduct. These procedures must have: (1) designated neutral individuals to receive and investigate misconduct allegations, (2) provisions to determine the merit of allegations, (3) a formal investigation process to reach a conclusion about allegations, (4) a designated individual who can impose administrative actions based on the conclusion of the investigation, and (5) provisions for reporting findings to ORI (Steneck, 2007). According to Klein (1993), in its effort to regain public trust, the federal government defined a problem and created regulations to control it without adequate agreement or knowledge on how to create conditions that support desired outcomes. According to Lafollette (2000), the result today is that scientists must deal with a regulatory apparatus

that the majority in the enterprise believe addresses neither the political problem nor threats to integrity in science.

Education on Responsible Conduct as a Response

It was not until nearly a decade later that management of integrity began to shift from detection and deterrence to prevention strategies. The formalized notion of education on the responsible conduct of research (RCR) began to take shape in late 1980s with the release of the first edition of *On Being A Scientist* in 1989. This guidebook, noted above, was geared toward graduate students and researchers in training (Kalichman, 2013; Tamot et al., 2013). According to Tamot et al. (2013), it was one of the first tools to focus on prevention of misconduct by advocating a higher standard of integrity and teaching to this standard. Also in 1989, the Institute of Medicine released *The Responsible Conduct of Research in the Health Sciences,* potentially the most influential report and body of instruction that created recognition of RCR as its own content area (Steneck & Bulger, 2007; Tamot et al., 2013). The report emphasized that traditional informal approaches to training through mentorship and socialization to the profession were useful and necessary but insufficient in and of themselves (Bulger & Heitman, 2007; Steneck & Bulger, 2007).

Around this same time, the National Institutes of Health (NIH) began to make minimal advancements toward a more proactive approach in promoting responsible practices in research, and by 1990 had adopted a requirement that “a program in the principles of scientific integrity be an integral part of the proposed research training effort” in its National Research Service Award training grant program (Steneck &

Bulger, 2007). The mandate did not establish a specific curriculum, but rather suggested content areas for instruction and allowed institutions to be innovative in how content was delivered. This initial requirement launched recognition and growth of RCR education and future federal mandates in this regard (Steneck & Bulger, 2007).

Throughout the 1990's, the federal government continued to expand on its requirements for RCR education, eventually asking for plans that included rationale, format, frequency, subject matter, faculty involvement, and attendance requirements of trainees, all of which had to be detailed and reported as part of the grant process (Tamot et al., 2013). By 2000, the Public Health Service (PHS) issued *Policy on Instruction for the Responsible Conduct of Research* covering nine core areas: (1) data acquisition, management, sharing, and ownership; (2) mentor/trainee responsibilities; (3) publication practices and responsible authorship; (4) peer review; (5) collaborative science; (6) human subjects; (7) research involving animals; (8) research misconduct; (9) conflict of interest and commitment (Pimple, 2002; Steneck, 2007; Steneck & Bulger, 2007). In response to the federal education guidelines, the quantity and variety of educational resources and curriculum proliferated exponentially (Kalichman, 2013). Beyond this framework, the continued growth of RCR education has been described as uneven and disorganized, with little financial commitment from the federal government to go along with requirements to provide formal RCR training (Steneck & Bulger, 2007).

The literature on RCR education includes a mix of perspectives analyzing, quantifying, and organizing the perceived inherent or conditional goals of instruction on integrity. As a result, Kalichman and Plemmons (2007) conclude that there is a lack of

consensus about goals for RCR education and that RCR is not universally viewed as central to research education. According to Tamot et al. (2013), "RCR did not emerge the way new academic fields usually do, but rather as a means to solve a political problem involving federal funding of research" (p. 349) and is a product created in response to tensions and negotiations among the federal government, academic institutions, individual researchers, the press, and professional associations.

Despite the extensive resources and curricula available on RCR, there have been "few efforts to systematically evaluate effectiveness" (Wells et al., 2014, p. 84), and outcomes are mixed and inconclusive. Assessments have highlighted inconsistencies in goals, content, and instructional methods (Dubois & Dueker, 2009; DuBois et al., 2010; M. W. Kalichman & Plemmons, 2007; Mastroianni & Kahn, 1999); nominal effects on knowledge gain and perceptions of value (Eastwood, Derish, Leash, & Ordway, 1996; Heitman, Olsen, Anestidou, & Bulger, 2007; Kalichman & Brown, 1998; Plemmons, Brody, & Kalichman, 2006); and in some cases, detrimental impacts of RCR education (Anderson, Horn, et al., 2007; Antes et al., 2010). Attempting to answer the question of how well RCR education is working, Kalichman (2013) concludes, "Taken together, it is hard to imagine an outcome measure nationally that should have improved as a result of the RCR education enterprise as it's now constituted" (p.390).

Mastroianni and Kahn (1999) assessed content and approaches to RCR courses for projects funded by the NIH T32 program of institutional pre-and post-doctoral research training grants by reviewing course materials, syllabi, curriculum, and other resources submitted to the funder by grantees. They found significant diversity in content

despite NIH's framework, as well as diversity in instructional methods and modalities both within and between institutions. A secondary conclusion pointed to the need for consistency in education content and delivery, but also the need for research on the effectiveness of education programs and ways to broaden the education and training to all scientists in training, regardless of funding (Mastroianni & Kahn, 1999). Seeking trainers' perspectives on goals and objectives, Kalichman and Plemmons (2007), interviewed 50 RCR educators and found that goals were "diverse and not well established." In a more recent study focused on the NIH's Clinical and Translational Science awards (CTSA), Dubois et al. concluded, (with 100 percent response participation from CTSA grantees), that there is no unified approach to RCR and "significant variation in scope, content, and approaches to RCR instruction" (2010, p. 110). Additionally, Dubois et al. (2010) found that most programs lacked a coherent institutional plan for RCR education and that instruction differed even within the same institutions across disciplines, and that in some cases, when multiple responses came from the same institution, they were contradictory.

A study conducted by Antes et al., (2010) evaluated the effects of instruction on RCR on decision-making in the four domains of: data management, study conduct, professional practices, and business practices. It cited nominal improvement of awareness and understanding of personal motivations in decision-making and a decrease after instruction in the use of strategies like seeking help in decision-making processes. This study showed no significant change with regard to the management of data, study conduct, or professional practices after receiving instruction and detrimental effects

pertaining to social-behavioral aspects examined which indicated that those who received instruction were more deceptive, retaliatory and neglectful (Antes et al., 2010). This study also found that there was a great desire among faculty instructors for RCR to determine "what constitutes effective ethics instruction and considerable concern that RCR instruction may not be working" (2010, p. 525). An analysis of the history of RCR education conducted by Kalichman (2013) concludes that, whereas much of the literature reveals a somewhat grim and unclear picture about the effectiveness of RCR education on an individual level as an approach to promoting integrity, it is not an indictment of the resources, curriculum, and individual courses but, rather, highlights the unintended consequences of creating an education discipline before purpose and goals are well defined, articulated, and generally accepted by the community that is charged with implementation.

A More Sophisticated Approach to Ensuring Integrity

Ensuring integrity in research is the responsibility of many stakeholders, particularly as science continues to evolve and multidisciplinary collaborations and multinational research models replace the era of single-investigator projects. A more sophisticated view recognizes the need for cooperation and commitment from all parties and levels of the enterprise (scientists, institutions, administrative leaders, governments, policy-makers, funders, journals, associations and societies, and the public), and in all parts of the world (Alberts et al., 2015; McNutt & Nerem, 2017; "Trouble at the lab," 2013). Issues of integrity have been discussed on a global scale over the last decade at

five World Conferences on Research Integrity. This international conference began in 2007 as a joint effort of the United States Office of Research Integrity and the European Science Foundation to promote discussions and action on issues and challenges related to research integrity worldwide (World Conferences on Research Integrity Governing Board, 2018). The conference has taken place every other year since inception and now includes participation from research institutions, funding agencies, government and non-governmental organizations including the American Association for the Advancement of Science, National Science Foundation, International Council for Science, the World Health Organization, Nature Publishing Group, and more (World Conferences on Research Integrity Governing Board, 2018). Each conference has led to exposure and dialogue on topics of research integrity and challenges faced by scientists, institutions, governments, and those involved in scientific study.

The most recent 5th World Conference on Research Integrity, held in Amsterdam, emphasized themes of transparency and accountability in research with the creation of an agenda for institutions and leaders to address lapses in integrity (World Conferences on Research Integrity Foundation, 2017). Respondents of the survey that was used to develop the priorities established in what is now known as The Amsterdam Agenda ranked "research institutions" and "researchers" as the most important players in promoting integrity. The Amsterdam Agenda's set of recommendations call for "greater emphasis on the assessment of efforts to improve integrity in research and the use of empirical information in developing research integrity policies"(World Conferences on Research Integrity Foundation, 2017, para. 2).

In addition to global dialogue, discussions related to issues of integrity have been building in the United States. An editorial published in 2014 by a group of prominent biomedical scientists outlined the systemic flaws of the US biomedical research ecosystem, calling on leaders and researchers to take a hard look at an unsustainable system that is creating a severe imbalance of scientists and research funding dollars (Alberts et al., 2014). The editorial provided several specific recommendations geared toward creating a more sustainable enterprise, including a call for the federal government to evaluate their policies and how these policies are executed at institutions and whether overarching goals might be met in other, better ways (Alberts et al., 2014).

The more recent *Fostering Integrity in Research* report from the National Academies of Sciences, Engineering, and Medicine (2017) also made several recommendations including the establishment of an independent, nonprofit Research Integrity Advisory Board (RIAB), to promote integrity across sectors and disciplines and work with all stakeholders to develop strategies to strengthen the self-correcting model and more effectively create the system conditions to foster the highest standards of integrity. Other recommendations in the report include: aligning and updating policies and processes to respond to the most current threats to the enterprise (such as changes in the environment like globalization, collaborative multi-disciplinary partnerships, and technological advances that may make it more difficult to ensure responsible practices) and continued development and assessment of integrity education and institutional administrative structures and programs that support research (National Academies of Sciences, 2017). This multi-layered view suggests that the management and promotion of

integrity involve a deeper analysis of environmental influences and system barriers to acting responsibly and acknowledges the existence of complexity and ambiguity in the practices and daily decision-making of researchers.

Layers of Influence

Multiple layers of influence directly and indirectly shape the actions, decision-making, and behaviors of scientists. The public, those that represent the public (policy-makers, government administrators), and other funders and sponsors of research make up the outermost layer of influence, establishing the focus in many respects for research lines and trajectories through funding streams and rule-making. Until recently, the federal government has been the largest funder of basic research performed at universities in the United States providing $39.4 billion of the nearly $75 billion total basic research dollars in 2012 (Press, 2015). Basic research constitutes activity aimed at "acquiring new knowledge or without specific or immediate use" (Mervis, 2017, p. 1005). *Recent data from the National Center for Science and Engineering Statistics reports the higher education* sector as the second-largest performer (business sector is largest) of research and experimental development (R&D) in the United States with $64.7 billion in 2015 (Pece, 2018). In 2016, federal agencies obligated $31.6 billion to institutions of higher education in support of science and engineering, up from the $30.5 billion obligated in 2015. Funding for research and development to universities and colleges accounted for 90 percent of the total federal science and engineering support to higher education institutions (Pece, 2018). The substantial public investment in the scientific enterprise

reinforces obligations on the part of researchers and institutions to maintain trust among the public by promoting responsible conduct in research.

Professional associations, journals, and academic disciplines represent the next layer of influence, providing guidance and norms of conduct related to professional practice, discipline-specific standards, standards for publication, educational opportunities, and influencing the research environment across spheres in a number of ways (Anderson & Shultz, 2003). Fields of study and academic disciplines shape the direction of new knowledge, research agendas, socialization of newcomers to the field, and provide social networks for those with complementing interests. Associations are often viewed as the liaison between government and research institutions, emphasizing approaches to integrity through instruction and model practices rather than regulations and sanctions (Anderson & Shultz, 2003).

The closest layer in proximity to the scientist is the university or institution that provides the immediate environment, context, and setting (lab, equipment, department) where research is conducted. The United States system of research education is complex and vast, with more than 335 doctoral-granting institutions, 100 of which are classified as "very high research activity" under the Carnegie Classification System for Higher Education (2015). The National Academy of Sciences *Fostering Integrity in Research* report (2017) categorizes research institutions' responsibilities into four areas: 1) creating and sustaining a culture of integrity; 2) monitoring the integrity of research environments; 3) addressing and investigating allegations of misconduct and misbehavior; and 4)

ensuring that leadership at all levels (executive, administrative, faculty) are knowledgeable, accessible, and engaged in the aforementioned three tasks.

Responsible Science, Volume I: Ensuring the Integrity of the Research Process (1992), a joint report of National Academy of Sciences, National Academy of Engineering and the Institute of Medicine, examines environmental influences and the role of individuals, institutions, and the government in ensuring integrity, provides a comprehensive backdrop in the review of literature on this topic that is still highly relevant and often referenced today. This pioneering report, the product of a two-year examination conducted by a panel of experts on research integrity, led the way for further study of environmental and organizational factors that influence the integrity of research, including but not limited to the literature summarized on this topic. A number of environment-related recommendations, framed to complement a self-regulatory model, were made to encourage responsible practices including: incorporation of checks and balances into operational parts of the research process at the lab or departmental level; deliberate education on the intricacies of the process; and informed communication and dialogue about the values that guide scientific decision-making in context. The report concludes, "In principle, guidelines for the conduct of research should be framed to fit local situations, including specific research fields and protocols, and should be formulated by the scientists who conduct research…" (p. 147). At the institutional level, the adoption and reinforcement of a set of formal guiding principles to provide a common frame of reference clarifying "the nature of responsible practices" should be considered (p. 147).

Pressures and Influences in the Research Environment

More recent literature supports the importance of institutional environment as it pertains to the integrity of research. In an examination of the normative principles of conduct among scientists, Anderson et al. (2010) conclude that, while institutions have the weight of the institutional system behind them in terms of policy, leadership, and socialization, they and, in turn, the scientists who work within their institutional system, are not resistant to the "contrary pressures" of the larger social system of which they belong (Anderson et al., 2010). Institutional norms are those that are able to resist contrary principles, and when these norms have been violated "one should look to contextual, environmental, institutional forces or pressures that encourage, reward or at least enable counter-normative behavior" (2010, p. 18). Anderson et al. (2010) also found significant dissonance between scientists' subscription to Mertonian norms (Merton, 1942), widely espoused principles and ideals of conduct in science, and perceptions of other scientists' behavior in the research environment. It is well-documented that scientists are subject to influences and pressures of their environment that compromise their adherence to commonly accepted norms and principles (Anderson, Ronning, De Vries, & Martinson, 2007; De Vries, Anderson, & Martinson, 2006).

Martinson, Crain, De Vries, and Anderson (2010) examine the idea of fairness and perceptions of organizational justice among mid-career scientists and whether or not this increases the likelihood of desirable or undesirable research practices. Significant direct associations were found between measures organizational justice and over-commitment and misbehavior along with significant interactions in predicting

misbehavior and ideal behavior. Additionally, greater perceptions of injustice were related to higher likelihood of engaging in a set of pre-identified serious misbehaviors, and perceptions of fairness were associated with higher reporting of ideal behaviors and decreased likelihood of reporting misbehaviors. Martinson et al. (2010) conclude, "The local environment of one's department, university, and regulatory oversight bodies appear to play important roles in fostering (or undermining) research integrity" (p. 78). Attention should be paid to interventions that may serve to moderate effects of stressors or strains that contribute to perceived ideas of unfairness in the research environment. At the institutional level, these interventions include transparent processes, systems, and policies with specific attention to communicating procedures to ensure fairness.

Yarborough et al. (2009) highlight the need for additional system examination to determine approaches to transition environments and culture in biomedical research from being rules-based to a "mature and proactive culture that culminates in trustworthiness" (p. 476). Geller et al. (2010) explore themes that contribute to ethical institutional cultures of research and found report compliance was only one of many factors that researchers see as creating a supportive environment. Respondents noted that in a "highly regulated environment, there may be subtle attitudes or patterns of behavior that are ethically problematic, even when blatant misconduct is not an issue" (p.1298), and emphasized need for understanding the ethical principles underpinning the rules as essential, particularly for young investigators learning to navigate complex regulations while designing studies and conducting research. This conflict highlights a gap in understanding of how the rules align with the principles. Themes from this literature

point to the need for less preoccupation on compliance and a move back to self-regulation that targets relationships, reduces tensions of hierarchy, creates blame-free environments that promote transparency, and employs preventative strategies that emphasize the moral reasoning behind decision-making.

Using an institutional-climate self-assessment tool, Crain, Martinson, and Thrush (2013) examine whether positive perceptions of climate are associated with positive research behaviors. Most findings were consistent with earlier research on self-reported behaviors and reinforce the central prediction among Crain et al. that positive perceptions of the research climate are associated with positive research behaviors (Crain et al., 2013; Martinson et al., 2006). Additionally, positive perceptions of climate are consistently related to endorsement of all four desirable research practice composites and less frequently to the four everyday undesirable practices. The most provocative finding, according to the authors, is that shared perceptions of climate are similarly predictive of both desirable and undesirable research practices. Also of note, FFP (fabrication, falsification, and plagiarism), the most serious of undesirable practices, showed no association to individual climate perceptions once separated from shared climate perceptions. Crain et al. conclude that these findings highlight the benefit of creating a shared research climate where there are positive perceptions of research integrity norms. The authors conclude that measuring aspects of culture and climate can be beneficial in diagnosing potential problem areas and capitalizing on the strength of climate to reinforce good practice and good behavior.

Proactive prevention of problems through small and consistent behavioral interventions is a strategy that is gaining traction in the patient safety movement, health care, and environmental policy among other places (Ariely, 2012; Hudson, 2003; Thaler & Sunstein, 2009). The field of behavioral economics, which draws on psychology and economics, is based on the premise that people are strongly influenced by certain elements in their environment. It offers a new perspective on interventions that proactively promote ethical decision-making in context (Ariely, 2012; Thaler & Sunstein, 2009). In contrast to a one-size-fits-all, compliance-centered approach, strategies based in behavioral economics would be intentional, pervasive, and focus on everyday behaviors of researchers in an attempt to normalize ethical decision-making over unethical. Examples include: moral commitments (i.e. pledges, oaths), continuous reminders of commitments, well-selected default options for decisions, and a working environment with clear norms of acceptable and unacceptable behavior with positive peer pressures (Ariely, 2012).

Adams and Pimple (2005) offer another perspective on the environment by describing an alternative opportunity framework by which to consider the promotion and management of responsible conduct in research. The idea of using informal social control emphasizes the characteristics of an organizational culture and work environment that exert influence on the behaviors of its members. Adams and Pimple define this social control as “the unofficial activity that is collectively practiced so as to increase and maintain conformity with the organization’s unwritten rules” (p. 233). These more informal processes of control can serve to detect misbehavior early on, when formal

processes do not, and can be more difficult to evade. Further consideration of other opportunity-based conceptual models in combination with an individualistic perspective may strengthen understanding of how institutions can influence environments and situations for researchers that would enhance ethical decision-making and deter unethical decision-making. Adams and Pimple recommend a focus on development of training, curriculum, and organizational processes intended to increase social interaction in the research environment to reiterate social norms and increase solidarity around research integrity.

Theoretical Perspectives in the Study of Institutional Integrity

Until fairly recently, there have been few ways for institutions to assess aspects of the research environment and institutional culture as it directly relates to research integrity, and little incentive to do so (Sieber, 2007). There has also been considerable reluctance among institutions to undertake in an introspective exercise that may result in more rules, oversight, and administration and potentially draw negative attention to an unsupportive organizational culture or worse "a climate that fosters misconduct" (2007, p. 1). Steneck (2011) notes this reluctance stems from investigators worrying that overly-rigid norms and rules could negatively impact scholarly autonomy, creativity, and the ideals that they hold central to a supportive research culture. These fears are not insurmountable and according to Sieber (2007), "institutions are increasingly recognizing that they must engage in honest introspection and learn how to make it easier for their

members to act with integrity…and learn how to make research environments easier places in which to be ethical *and* do good science." (p. 2).

Many factors contribute to perceptions of organizational integrity, not least of which is the source of the judgement. Research on ethics in organizations treats behavior in organizations as a function of both the characteristics of individuals in the organization and contextual factors (Ardichvili, Mitchell, & Jondle, 2009). Among the contextual factors, organizational culture and external pressures are understood to be of major importance (Ardichvili et al., 2009). Organizational culture has been studied and defined in various ways over time and include a range of visible events like: customs, rituals, and behavioral regularities when people interact; group norms and standards of practice; espoused values; accepted working rules; climate; skills and competencies; shared meaning; and symbols (Schein, 2010, p. 14). External forces like the regulatory rules and oversight mechanisms created to manage research conduct at universities have the ability to shape organizational behavior and, in turn, organizational culture.

A research university's growth, success, and overall ability to function long-term is, in many ways, contingent on maintaining confidence among stakeholders external to the organization who have the ability to influence institutional activities (policy-makers, funders, constituents) and remaining attentive to social expectations and obligations while supporting its organizational members. A more complex model is necessary to explore the approaches taken by universities to fulfill and maintain social expectations their potential connection to internal perceptions of the organization among members.

Two perspectives in the study of organizational behavior, organizational legitimacy and organizational virtuousness, represent this external-internal dynamic.

Organizational Legitimacy

Legitimacy has become a central component in the study of formal organizations, organizational behavior, and organizational effectiveness. Foundational work from Parsons (1960), Dowling and Pfeffer (1975), Meyer and Rowan (1977), and DiMaggio and Powell (1983) discuss legitimacy as the means to organizational survival, with the literature detailing actions to affirm and demonstrate legitimacy as forces that "constrain, construct, and empower organizational actors" (Suchman, 1995, p. 571). After more than four decades of research on legitimacy in organizations, theorists still hold distinctive ideas about how to define and categorize this idea. Legitimization of organizations is dependent upon the present interests and expectations of society and the level of importance stakeholders give to the purpose and activities undertaken by the organization. Legitimacy reflects the properties, processes, and actions of an organization from the viewpoint of an external audience of stakeholders.

Parson's (1960) view of legitimacy places emphasis on resource distribution, defining it in terms of shared values in the context of a larger social system, where an organization justifies its right to exist through its activities, particularly in a system where resources may otherwise be allocated. Dowling and Pfeffer (1975) share a similar view, defining legitimacy as the congruence of organizational activities with the norms of behavior deemed acceptable in the larger social system of which they are a part, but argue that it is not solely about competition for economic resources; rather, survival depends on

the existence of three interdependent sets of organizational behaviors: complying with the law, economic viability, and legitimacy (Dowling & Pfeffer, 1975). According to Dowling and Pfeffer (1975), legitimacy is a dynamic idea because it is shaped by the values and norms most prevalent in society and those external to the organization. Societal views are reflected in a broader culture and these dynamic norms and values tend to be a "source of pressure for organizational legitimization" because organizations must continually adapt and change to maintain congruence (p.125).

According to Suchman (1995), organizations prove legitimacy in multiple ways in order ensure survival. Various typologies distinguish and assess aspects of the legitimation process, with most identifying as strategic perspective (also known as managerial) or an institutional perspective (Dowling & Pfeffer, 1975). Dowling and Pfeffer (1975) describe the strategic perspective as one that focuses on how organizations communicate and use symbols and tangible outputs (profits, sales, figures) to convince the public of its legitimacy. This point of view assumes a high level of management and organizational control in the process. In contrast, the institutional view emphasizes a broader, sector-wide dynamic, transcending the ability of any one organization to control (Meyer and Rowan, 1977). Suchman (1995) summarizes the distinction between the two orientations: "strategic theorists adopting the viewpoint of organizational managers looking out, whereas institutional theorists adopt the viewpoint of society looking in" (p. 577).

Meyer and Rowan's (1977) Institutional Theory asserts that organizations create and incorporate practices and procedures that are defined by prevailing views of society

in order to demonstrate legitimacy and increase chances of survival "independent of the immediate efficacy of the acquired practices and procedures" (p. 340). They argue that the formalized rules established in institutionalized organizations are actually myths of their environments and a "sharp distinction should be made between the formal structure of an organization and its actual day-to-day work activities" (Meyer & Rowan, 1977, p. 341). Gaps are intentionally created between formal structures and work activities to buffer the organization from the uncertainties of external institutionalized expectations and rules (Meyer & Rowan, 1977). These rationalized myths are binding on organizations in two ways: 1) they are impersonal prescriptions that identify social purposes as technical and create rules to pursue these technical purposes, and 2) they are highly institutionalized and therefore removed from the discretion of individual members and participants of the organization. As a result, according to Meyer and Rowan (1977), "organizations structurally reflect a socially constructed reality" (p. 346).

Suchman (1995) provides a three-category typology, distinguishing among pragmatic, moral, and cognitive legitimacy with all three sharing the assumption that organizational activities are based on a socially constructed, desirable system of values, beliefs, and norms. Pragmatic legitimacy emphasizes influence and incorporation of the immediate audiences of the organization in actions taken by the organization. For example, an organization establishes a policy to address a specific to a group of constituent concerns, or incorporates constituents into decision-making processes such as boards and committees (Suchman, 1995). Moral legitimacy places emphasis on an altruistic foundation and usually "reflects beliefs about whether the activity effectively

promotes societal welfare, as defined by the audience's socially constructed value system" (p. 579). Cognitive legitimacy relies on plausibility and comprehensibility among the larger social system. In other words, the existence of the organization and its activities must make sense to constituents and participants from a cultural perspective and relate to their personal experiences (Suchman, 1995).

A study conducted by Reuf and Scott (1998) on organizational legitimacy analyzed the effects of two other types, managerial and technical, in 143 hospital organizations. According to Ruef et al. (1998), hospitals operate in highly institutionalized environments, and therefore pressure exists on both the managerial and technical components of the organization. The authors reason that legitimization activities at the institutional level can be targeted to both the technical (operational systems responsible for input and output) and managerial (resources for technical systems) levels of the organization. They examined various indicators of legitimacy and their effects on organizational survival over a 46-year period, finding variation in the benefits and antecedents associated with managerial and technical processes and functions of the hospital and they determined that "salience of managerial and technical forms of normative legitimacy can fluctuate across institutional regimes" (Ruef & Scott, 1998, p. 898). Reuf and Scott assert, "Whether an organization is legitimate, or more or less so, is determined by those observers of the organization who assess its conformity to a specific standard or model" (p. 880). Hospitals that achieve high levels of legitimacy in managerial activities enhance their chances of survival in regimes that are characterized

by formal relations, while hospitals that are highly legitimate from a technical perspective enhance survival in centralized funding and regulatory regimes (Ruef & Scott, 1998).

Organizational Legitimacy in the Context of Research Integrity

Legitimacy is often viewed as a constraint on organizations that likely affects some types of organizations more than others because of visibility and reliance on social and political support (Dowling & Pfeffer, 1975). In higher education, social responsibility is a fundamental component tied to the purpose and existence of the institution. Postsecondary institutions are complex organizations that require skilled management and effective frameworks for decision-making and communication with external consumers; however, contemporary institutions and research universities, in particular, exist to advance broader societal purposes of education, discovery, and knowledge production to a vast array of stakeholders internal and external to the organization. They are highly sophisticated organizations made up of communities of scholars, researchers, and students with a long tradition of shared governance and self-management, but they also rely on public support to carry out this broad mission (Rumbley et al., 2014). Convincing a multitude of external observers and stakeholders of organizational legitimacy is necessary for institutional survival.

Like hospitals, research universities operate in a highly institutionalized environment. The legitimacy of the research university from an organizational standpoint relies on an external regulatory structure that has authority over all research institutions in an effort to demonstrate alignment with social values and norms related to the conduct of research and maintain trust. To achieve legitimacy, formal structures exist as a product of

the networks and activities within the organization created to adhere to the regulatory structure. These include the policies, laws, programs, procedures, and positions manifested and enforced by public opinion, particularly for institutions with social obligations (Meyer & Rowan, 1977). As new social and environmental challenges and expectations arise with respect to organizations and those conducting the work within these formalized institutions, more rules result as a means to convince the public of its legitimacy.

The actions taken by a research university to achieve legitimacy in the eyes of the public reflect the policies, systems, and positions that exist to support adherence to federal research regulations. Research institutions must provide assurances to the federal government that policies and processes exist to properly administer research funds, respond to misconduct allegations, protect human and animal subjects in research, protect whistleblowers, manage data properly, and educate their investigators on the responsible conduct of research ("About ORI: The Office of Research Integrity," 2018). These offices, policies, and systems are the properties of a legitimate research institution.

Formal infrastructure (offices, units, positions). As part of their operational infrastructure, universities with high level research activity typically have an Office of the Vice President for Research or similarly leadership umbrella that oversees institutional-level units charged with managing the requirements associated with federal grants and regulations on human, animal, and biotechnology research. These units exist to assist investigators with grant management and adherence to sponsor regulations and

typically function at the institutional level to handle the aspects regulatory compliance that pertain to a vast majority of researchers who are federally funded.

Investigators at the institution interact with leaders and research administrators at different points in the process. By and large, research administrators view their role as a service that supports investigators and the enterprise in achieving compliance. The National Council of University Research Administrator's (NCURA) Statement of Principles outlines six responsibilities of research administrators, with the foremost being to keep faculty apprised of regulations, policies, and procedures that affect how they conduct research and, for institutions, the appropriate stewardship of external funds supporting research and scholarship (National Council of University Research Administrators, 2018). The principles also highlight the responsibility of administrators to communicate and promote understanding of institutional policies and processes in this regard.

Policies, procedures, and oversight mechanisms. There is not one single entity, branch, site, or source that governs all research in the United States, but rather a variety of rules, laws, and guidance that cover particular types of research, subject areas, and activities. At the university level, a host of policies, procedures, and oversight mechanisms exist in response to federal regulations that apply to investigators conducting research at and on behalf of the institution. Some policies like the handling of hazardous material; use of human tissue, donated bodies, or stem cells; disposing of controlled substances; and the reporting of software inventions, are related to specific activities that involve certain types of investigations. This study will focus on a broader subset of

research policies, practices, and systems that apply to a vast majority of funded investigators across the institution including: research misconduct (handling allegations, conducting an inquiry, investigations, whistleblower protections), individual and institutional conflicts of interest; research data management practices (sharing, owning, security, storage); and education and training in the responsible conduct of research.

In December of 2000, the Office of Science and Technology (OST) of the White House published the first Federal Research Misconduct Policy requiring all federal agencies that provide extramural funding (funding to institutions and non-federal agencies) to implement specific guidance on research misconduct. The OST policy established a definition of research misconduct and provided basic guidelines for research institutions. In response, research institutions in the United States developed misconduct policies and processes to adhere to sponsor requirements that call for specific procedures and with accompanying positions and oversight bodies to investigate and handle allegations of research misconduct. Conditions of these requirements include things like: clear articulation of "deciding officials" in the process, record-keeping of inquiry, reporting the opening of an investigation, interactions with other offices in gathering information, confidentiality, time limitations of the investigations, and whistleblower protections (Public Health Service 42 CFR 50). Almost 5,000 institutions in the United States and worldwide who receive Public Health Service funding sign assurances of compliance with 42 C.F.R. Part 93 that specify these conditions (United States Department of Health and Human Services, 2018).

Similarly, policies on individual and institutional conflicts of interest are required by sponsors in an effort to ensure that research is unbiased. The National Science Foundation's guidance discusses the importance of continually earning the public's confidence in the integrity of its funded research, and, to do so, decision-making must avoid even the "appearance of impropriety" (National Science Foundation, n.d.). In turn, institutions have policies that require investigators and deciding officials at the university to disclose any significant economic interests and affiliations that they and any immediate family members may have that have the potential to connect to their research or responsibilities. As part of this process, an institutional conflict review oversight panel exists to evaluate whether reports of University or individual gifts, royalty earnings, purchases, and industry sponsored research projects may present a conflict.

The proper and secure management of data, which includes things like record-keeping procedures, information sharing, and a host of practices critical in the research process is another subset of conduct subject to external sponsor requirements and fulfilled by the research institution. Most federally funded projects require a data-sharing plan as part of the grant application and as a condition of the award. For example, the National Institutes of Health guidance on the management of data states, "final research data should be made as widely and freely available as possible while safeguarding the privacy of participants and protecting confidential and proprietary data" (National Institutes of Health, 2003). Similar conditions are specified by other federal funders to encourage openness and facilitate sharing (University of Minnesota Libraries, 2018). Institutions provide researchers with data-management-plan templates and guidance in order to fulfill

requirements to collect, organize, and store the data they collect. Institutional data-management practices commonly come under the purview of an oversight committee within the Office of Research that is charged with making recommendations in in the central management of data in order to meet regulatory requirements.

Education in the responsible conduct of research. Faculty and student investigators who conduct funded research are required to complete education in the responsible conduct of research (RCR). Most institutions provide a core curriculum that is delivered online and contains modules with case vignettes and generalized one-size-fits-all content about ethical decision-making, federal regulations, assessing risk, informed consent, privacy and confidentiality, and responsible decision-making. Investigators must complete and pass this training prior to using funds and starting research activities. Some investigators are also required to complete training required by the sponsor or the Institutional Review Board if conducting human subjects research in addition to these core requirements. Some universities also host periodic educational events like annual research ethics days where all researchers are encouraged to attend and learn about specific and timely topics from expert panelists. The library, technology offices and other central support units also offer guidance, workshops, and resources to support investigators in the research process.

Organizational Virtuousness

Over the last two decades, research has explored properties, factors, dimensions, and mechanisms associated with highly functional organizations (Bright & Fry, 2013). This body of literature is often described as positive social science, positive deviance,

positive organizational ethics, and more formally, positive organizational scholarship (Bright & Fry, 2013; Cameron & McNaughtan, 2014). Organizational virtuousness reflects a set of internal characteristics of an organization and is an ideal rooted in the larger field of positive organizational scholarship, which is defined by four fundamental aspects: adoption of a positive lens, emphasis on positively deviant outcomes, affirmative bias, and examination of the best (most virtuous) elements of the human condition (Cameron & McNaughtan, 2014; Cameron & Winn, 2012). Organizational virtuousness is a term established by Cameron et al. (2004), to emphasize the positive elements in an organization. It is both a state of being as well as the actions taken by the organization to improve performance and achieve moral excellence (Cameron et al., 2004).

According to Ribeiro and Rego (2009), organizational virtuousness is tied to the elevating behavior of individuals in an organization and its key attributes center on human impact (flourishing moral character, self-control, resilience), moral goodness (what is good and "right"), and social betterment (social value that extends beyond the individual and organization). It is the manifestation of virtues in an organization as evidenced through the actions and decision-making of actors within the organization as well as the processes and systems established to support these actions (Caza, Barker, & Cameron, 2004; Ribeiro & Rego, 2009; Vallett, 2010). According to Vallett (2010), organizational virtuousness differs from organizational values in that values tend to shift over time and are tied to organizational goals such as profitability and other operations-centered outcomes, whereas virtuousness is transcendent and rooted in the "human fabric" of the organization and its activities are tied to a larger purpose of moral good.

Virtuous organizations amplify positive emotions related to work environment through reinforcement of good behavior; facilitation of trusting and cooperative relationships among individuals within the organization; promotion of pro-social behavior such as openness and transparency; and fostering a pre-disposition to acting in supportive ways toward one and other (Cameron et al., 2004). Virtuous organizations also have the ability to buffer against negative or potential damaging and unexpected situations and help to prevent dysfunction within the organization (Cameron et al., 2004). Many of these ideas also align with literature in the field of behavioral economics, which support the premise that people are strongly influenced by elements in their immediate environment (Ariely, 2012). Evidence from this field show that factors such as strong interpersonal relationships among organizational members, accepted and reinforced social norms, and reminders of and commitments to ethical and social standards have the ability to influence collective decision-making and behavior in positive ways (Ariely, 2012).

Empirical research by Cameron and colleagues found a relationship between perceptions of virtuousness among organizational members and organizational performance and effectiveness (Bright, Cameron, & Caza, 2006; Cameron et al., 2004; Cameron, Mora, Leutscher, & Calarco, 2011; Kelly & Cameron, 2017; Rego, Ribeiro, & Cunha, 2010; Vallett, 2010).

Over the last two decades, there have been several studies that link virtuousness in organizations with desired performance, most notable Cameron et al.'s (2004) examination of 16 industries that reveals positive associations between five elements of

virtuousness and measures of profitability, employee retention, productivity, and customer satisfaction. Using instruments in the psychological literature that were used to assess moral behavior in individuals as well as the literature on universal virtues, Cameron et al. (2004) created a 60-item survey asking respondents to characterize elements like trustworthiness, appreciation, openness, love, commitment, respect, generosity, and humility to capture perceptions of these concepts enabled by the organization. Using factor analysis, a statistically viable five-dimensional measure of organizational virtuousness emerged. This measure of organizational virtuousness has been the most consistently used and supported representation in current literature.

The five-factor model includes measures of optimism, trust, compassion, integrity, and forgiveness, with three descriptive statements corresponding to each dimension. Optimism means that members of an organization feel they have the ability to succeed, even in the face of challenges. The statement centers around the idea that there is a profound purpose to the work of the organization and members are dedicated to doing good. Trust encompasses the relationship aspects among peers and colleagues as well as respect of leadership and is described using the words courtesy, respect, and consideration. Compassion is illustrated through acts of care within organization among members as being a common occurrence and care is expected and discussed regularly. Integrity incorporates the ideals of honesty and honor as a pervasive theme throughout the organization in its work. Forgiveness is described as a component of a compassionate culture where mistakes are viewed as a learning opportunity and generally forgiven (Cameron et al., 2004).

Virtuous practices. Practices in organizations used to foster virtuousness have been explored in studies on corporate culture in the financial, real estate, and health care sectors and include activities that connect members to the larger purpose of their daily work as it relates to both organizational goals and contribution to the greater societal good (Cameron & McNaughtan, 2014). Virtuous practices described in case studies include: processes that facilitate participative goal setting; reinforcement of virtuous norms and positive deviance through awards, commitments, and other value-centered systematized actions that demonstrate not only who has been successful but the ways in which it was successful; activities among members within the organization that facilitate relationship building; and opportunities for enhancement of individual skills, knowledge, and personal development (Cameron et al., 2011; Cameron & Plews, 2012).

In a case study highlighting virtuous practices, Prudential Real Estate CEO Jim Mallozzi lists the following as activities used to promote a virtuous culture: articulation of Everest goals (goals about what an organization aspires to be, as related to a broader purpose); engaging organizational members in ideas about how to make the company better; demonstrating caring and compassion with customers; development of a core team or network of organizational members dedicated to fostering positive deviance through ongoing demonstration and communication of values and norms; and, organization-wide acknowledgement and celebration of strengths and successes (Cameron & Plews, 2012). According to Mallozzi, ideas and interventions must come from all levels of the organization, and, when successes occur, they must highlight not only the person who is being celebrated, but also the “what” and “how” success was accomplished. Those who

achieve the desired positive outcomes become unofficial mentors to carry messages and activities forward (Cameron & Plews, 2012). They gradually become norms and accepted ways of working and operating as members of the organization carry forward these ideas.

Organizational Virtuousness in the Context of Research Integrity

A 2010 study explored the relationship between organizational virtuousness and culture in continuing education units, finding organizational virtuousness to be a useful construct in the analysis of organizational behavior in a higher education context (Vallett, 2010). Vallett (2010), found that three of the original five factors (compassion, optimism, integrity) from Cameron et al.'s (2004) foundational study emerged as traits that contribute to an overall virtuous higher education unit. Three additional factors emerged as well: benevolence, profound purpose, and joy, which the author attributes to the difference in organizational focus (i.e. a non-profit verses a for-profit entity) (Vallett, 2010). The factor of benevolence was described using words like trust and gratitude, and statements like "a climate of trust exists here" (Vallett, 2010, p. 135). The factors of joy and profound purpose may be partially explained as an aspect of working for what the author refers to as a "helping profession," one where a larger purpose exists for individuals beyond those directly impacted by the work and one where there is a commitment to a common good (Vallett, 2010). This study also found that group culture is associated with all six virtuous factors, providing evidence of a relationship between organizational virtuousness and organizational culture (Vallett, 2010).

Five factors of virtuousness in the research environment. The five factors that emerged from Cameron et al.'s (2004) analysis of virtuousness are: optimism, trust,

compassion, integrity, and forgiveness. These factors can be translated into the context of research integrity at a research institution. Optimism, as defined by Cameron et al. (2004), is similar to Vallett's (2010) characterization of joy and benevolence, in that it is defined as a sense of purpose and commitment to a larger end or societal good. The purpose of research is the extension and dissemination of knowledge for the good of humanity and use beyond the walls of research (Committee on Scientific Freedom and Response 1997). This sense of purpose drives the work, decision-making, and behavior of researchers. The factor of optimism becomes a factor of purpose in a research setting.

Trust, characterized by Cameron, emphasizes relationships within the organization and is described using words like respect, courtesy, and consideration. Trust is a central tenet in research, encompassing the principle of scientific freedom, which represents the ability to pursue and apply knowledge openly and is inextricably linked to scientific responsibility (Jarvis, 2017). The literature is unequivocal in emphasizing that the stability of the research enterprise hinges on trust at all levels, including individual and institutional levels. While organizational legitimacy addresses trust between the research community and the public, organizational virtuousness is focused on the trust relationship in the research environment among institutional members.

The factor of compassion is described by Cameron et al. (2004) as a sense of caring and concern among organizational members. Compassion in a research environment translates to a sense of collegiality among investigators and research actors at a University and is demonstrated through actions like sharing information, mentorship (formal and informal), recognizing people for achievements, showing genuine interest in

other people's work, and treating people with respect and dignity. Trust and collegiality reinforce each other in the research environment and bind people together in their work.

The factor of integrity is often used synonymously with virtuousness. Cameron et al. (2004) characterizes it using statements like "this organization is would be described as virtuous and honorable." In the research environment, integrity represents a commitment to the highest standards of ethical behavior, responsible decision-making, and rigor in the conduct of research. It is a collective commitment to strive for the highest standards in the designing, planning, conducting, and reporting of research (National Academies of Sciences, 2017).

Forgiveness, the final factor identified by Cameron et al. (2004) represents the idea that, even with the highest standards of conduct, mistakes occur and a virtuous organization values learning from mistakes. Forgiveness corresponds to the idea of openness in a research environment. Openness means operating in such a way that others have the ability to see what actions are performed and understand decision-making processes. It implies accountability, transparency, and communication throughout the process of research in an effort to limit mistakes or questionable practices and respond to them appropriately when they do occur. Openness is also good record-keeping of decision-making processes and the proper management of data.

Virtuous practices in a research setting. Creating a culture of positive deviance relies more heavily on small interventions and activities that are ongoing and reinforce a common purpose rather than large-scale development activities that tend to take years to measure and are oftentimes ambiguously connected to the daily activities of

organizational members outside of the leadership team (Cameron & Plews, 2012). In a research university setting, activities and interventions correspond to a number of practices to promote organizational virtuousness. Research indicates that practices need to be internally-centered and people-oriented rather than externally-focused and process-oriented (Vallett, 2010).

One tangible example of a virtuous practice is the creation and adoption of an Institutional Code of Conduct, which defines the university's values and standards of behavior that are to be accepted and used by faculty, staff, board members, and other professional representatives of the organization. In most cases, a separate but similar code exists for students. The Code establishes written principles for acting with integrity and is intended to guide both individual decision-making and institutional policies and procedures of the University. A Code of Conduct has the potential to be viewed as a tool to facilitate a commitment among members to act with integrity and pursue virtuousness in their research if the development and communication of this pledge included those who are expected to abide by its standards. The way in which an institution communicates, emphasizes and uses its Code of Conduct could be carried out as a practice that promotes positive deviance.

Celebrations and communication of successes large and small through organizational awards, newsletters, events, and meetings are another way in which a university may implement positive organizational deviance. Activities that bring organizational members together such as peer research groups and networks, research teams, peer mentoring, and positive interactions with administrators and support

personnel are activities that facilitate relations and trust-building within the organization and have the potential to promote openness among researchers as well as the development of trust for research administrators. Similarly, having access to the necessary and desired equipment, facilities and other resources needed to conduct research in the most virtuous manner can demonstrate an organizational commitment to supporting the success and growth of individuals.

These two theoretical constructs, organizational legitimacy and organizational virtuousness, will be used to frame connections between the formal actions taken by research universities to manage and comply with expectations related to responsible conduct in research and their potential connection to internal organizational characteristics and processes that promote virtuousness.

CHAPTER 3

CONCEPTUAL FRAMEWORK AND METHODOLOGY

Research on research integrity has been largely focused on analyzing the actions and motivations of individuals who have engaged in misconduct or undesirable decision-making ("bad apples") and developing rules to respond to or prevent these types of egregious behavior. As detailed in Chapter 2, there is a growing literature on the influence of elements in the research environment and its relationship to the behavior and decision-making of researchers; however, there's limited attention to how the externally mandated rules impact the internal culture of an organization.

The purpose of this study is to explore perceptions about the formal actions externally required of research institutions as well as perceptions about internal elements of organizational integrity among members of the institution, and to determine whether or not these two ideas connect and in what ways. This chapter begins with a description of the theoretical underpinnings used to explore this relationship, framing the research question with two constructs: organizational legitimacy and organizational virtuousness. Following this description, a thorough overview of the research methodology including design, method, protocol, and analytic approach is provided.

Conceptual Framework

A university, through its accepted organizational norms, has expansive ability to create a context for acting with integrity. There is evidence that virtuous traits related to

an organizations' culture are associated with performance and productivity among actors within the organization (Cameron et al., 2004). A research university upholds the trust of the public and demonstrates legitimacy by complying with federal regulations and implementing systems and processes to ensure responsible and ethical research. Externally mandated rules become institutionalized in processes and systems at the university, raising questions about the ways in which these rules shape research environments, how they are perceived and carried out by researchers, and how they interact with elements of an organization's culture.

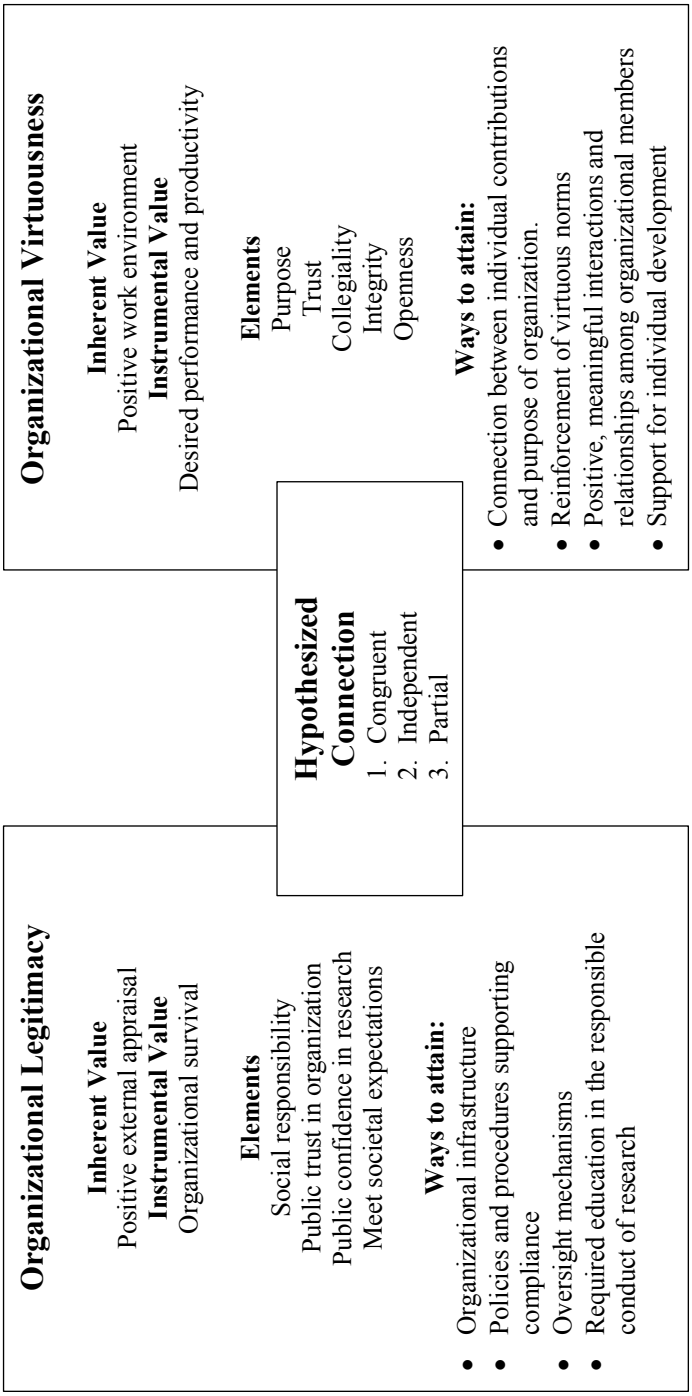
The conceptual framework for this study relies on two theoretical constructs to explore this relationship: organizational legitimacy reflects the formal properties, actions, mechanisms and structures of an institution used to meet external social expectations in research and uphold public trust, and organizational virtuousness reflects the virtuous characteristics, properties, systems, and actions of an organization that contribute to a desirable research environment and culture of integrity at an institution. The research question for this study is: *How do perceptions of the formal actions taken by a research university to achieve organizational legitimacy relate to perceptions of organizational virtuousness among research actors at the institution?*

To answer this question, this study: 1) explores perceptions about each of these constructs from the perspective of research actors (specifically, faculty researchers and research administrative leaders) in the organization, and 2) explores to what extent these two constructs are related and exhibit mutual influence.

Theoretical Constructs

The conceptual framework for this study is presented in Figure 1. The literature on legitimacy as it relates to the actions and behaviors of formal organizations

Figure 1: Conceptual Framework



emphasizes the systems, rules, positions, and processes that are used to fulfill the expectations and interests of stakeholders external to the organization as a means to organizational survival (Parsons, 1960; Dowling & Pfeffer, 1975; Meyer & Rowan, 1977). Foundational work by Parsons (1960) underscores the economic-and resource-distribution aspect of legitimacy. In formal organizations where externally distributed funds are necessary for survival, administrative systems and processes are created to justify the responsible use of funds and are therefore considered fundamental to organizational survival.

Dowling and Pfeffer (1975) and Suchman (1995) expand on this idea, arguing that legitimacy is not solely about justifying the use of shared resources, but also includes activities that respond to the legal, ethical, and social norms deemed acceptable by the larger social system in which the organization exists. According to Dowling and Pfeffer (1975), legitimacy is shaped by the prevailing views, expectations and norms of the broader culture. An organization's survival depends on its ability to reflect and respond to these dynamic expectations in its daily activities. Meyer and Rowan (1977) agree in part with the idea that an organization must create formal systems and processes that reflect the norms of society and respond to external expectations in order to increase its chance of survival; however, they argue that these institutionalized practices are actually myths of their environment and do not connect to actual day-to-day work activities. Formal infrastructure exists solely for organizational survival and works as a buffer to shield the organization from dynamic and uncertain social expectations.

The concept of legitimacy in the context of higher education, public research universities in particular, is especially relevant because of their reliance on social support to carry out the research aspects of the institutional mission. In addition to teaching and learning, research universities exist to advance broader societal purposes. In order to fulfill these responsibilities, the public must trust and have confidence in the research endeavors of the institution. As shown in Figure 1, the central elements of organizational legitimacy in this context are social responsibility, public trust in the organization, public confidence in research, and meeting societal expectations. Formal systems and rules are created in order to achieve these elements and ultimately maintain organizational survival.

Highly institutionalized environments, like research universities, organizations rely on an external regulatory structure in order to align with and respond to social expectations. Adherence to standards that are established for all research universities confirms legitimacy as viewed by the public. The characteristics of and actions taken by a research university to achieve organizational legitimacy are depicted in the first box in Figure 1. They include the existence of an operational infrastructure (offices, units and positions) that supports compliance; policies, procedures, and oversight mechanisms that ensure adherence to research regulations (research misconduct, conflicts of interest, data management); and required education in the responsible conduct of research. These formal actions all play critical roles in legitimizing the research activities of the university in the eyes of external stakeholders (e.g. funders and the public) and ultimately

reinforce the prevailing contract between science and society to produce reliable and trustworthy knowledge.

Organizational virtuousness represents positive characteristics, actions, and properties of an internal organizational culture depicted in the second box in Figure 1. According to Cameron and Winn (2012), organizational virtuousness is the way in which an organization supports and enables virtuous decision-making and actions among its members through the activities, processes, structures and routines in an organizational setting that perpetuate positive relationships, meaningful work, enhanced learning, and social development among individuals in an organization. The inherent value of organizational virtuousness is a desirable work environment, and the instrumental value is improved performance and productivity among organizational members, leading to desired organizational outcomes.

Organizational virtuousness represents a set of characteristics in the culture of an organization that emphasize positive elements. According to Cameron et al. (2004), it is both a state of being and the actions used within an organization to emphasize positive outcomes and improve overall performance. Two key components of organizational virtuousness are the adoption of a positive lens in daily work activities and the elevation of the best or "most virtuous" elements of individuals who work in the organization (Ribeiro & Rego, 2009). According to Cameron et al., virtuous organizations reinforce desired behavior by amplifying the positive aspects of the work environment and rewarding those who display these attributes (2004). These ideas align with literature in the field of behavioral economics, which supports the premise that internal and

environmental forces have the ability to shape behavior and decision-making, and environments can be structured to achieve desired decision-making and outcomes (Ariely, 2012).

Cameron et al. (2004) developed a five-characteristic model used to measure organizational virtuousness that includes optimism, trust, compassion, integrity, and forgiveness. Three additional factors (benevolence, purpose, and joy) emerged in a more recent study of non-profit organizations (Vallett, 2010). These elements are attributed to differences in organizational purpose between profit and non-profit organizations. For this study, Cameron et al.'s original five factors were adjusted to align with the context of research integrity at a research institution. The second box in Figure 1 shows purpose, trust, collegiality, integrity, and openness as the characteristics of organizational virtuousness in a research-university context.

Purpose represents the overarching commitment to a larger social responsibility in the work undertaken at the organization. This element aligns with Cameron et al.'s (2004) description of optimism, which is the main factor or source of motivation that drives individuals in their work. Trust is a central element that influences decision-making in all types of organizations where human interaction is essential. In a research context, the stability of the entire enterprise hinges on trust among individuals and at all levels. The trust related to organizational virtuousness focuses on relationships among actors within the organization. Compassion is described by Cameron et al., (2004) as relating to personal care and concern for those in the work environment. In the research context, this translates as collegiality, which encompasses the ways in which people work

together, their desire to work with others rather than individually, and the positive relationships and outcomes that occur as a result of working together.

Integrity in work environments is associated with having values and principles that are morally sound. Other words used to describe integrity in the research context are high standards, rigor, responsible conduct, and ethical practices. The final factor identified by Cameron et al., (2004) is forgiveness, which centers on the idea that mistakes are inevitable but should be viewed and treated in an organization as learning opportunities. When this factor is reinforced in an organizational culture, there is less fear and cover-up when mistakes do occur. In research, this closely corresponds with the idea of openness. Openness is synonymous with transparency, accountability, and sharing of information. When openness exists, the potential for mistakes to be spotted increases, and, in turn, the ability to learn, respond to, and improve performance grows.

Ongoing activities and interventions that influence behavior are described and supported in the literature on organizational virtuousness and behavioral economics. According to Vallett (2010), activities to achieve the elements of organizational virtuousness must be people-centered with a focus on internal culture, with less concern on externally driven measures and expectations. Figure 1 lists reinforcement of virtuous norms, support of positive interactions and relationships among members, and support for individual development, as possible ways to foster purpose, trust, collegiality, integrity, and openness.

More specifically, in a research university, activities to reinforce positive elements could include celebrations and communications of successes like research

awards, promotion, or opportunities for individuals to present or share their work with colleagues. Activities within the organization that bring people together around their work such as peer research groups, seminars, peer-to-peer mentoring programs, retreats, and weekly planning meetings, reinforce shared purpose and build collegiality, trust, and openness. In short, the activities undertaken within the organization to foster strong relationships among its members and amplify desired behavior, will contribute to its overall organizational virtuousness.

Theoretical Connections

Organizational virtuousness has seldom been explored in a higher education context or in highly regulated sectors like health care. It has not been directly studied in the highly institutionalized environment of a research university or in regard to its relationship to organizational legitimacy. The conceptual model (Figure 1) displays a box connecting the two constructs, representing three hypotheses related to the potential connections exhibited between organizational legitimacy and organizational virtuousness. This qualitative exploration could generate multiple scenarios to improve understanding of possible connections and mutual influences of organizational legitimacy and organizational virtuousness in a research integrity context.

Hypothesis 1: Congruence. The first hypothesis posits congruence between organizational legitimacy and organizational virtuousness. Congruence signals agreement, compatibility, and consistency. In other words, the rules, processes, and systems that represent organizational legitimacy are largely congruent with and connected to the activities, processes, and traits that exist in a virtuous organization.

There is little or no barrier between these two perspectives, and they are directly linked (positively or negatively). For example, participants who report favorable perceptions about the effectiveness of the required general education for responsible conduct of research at the university may also report favorable perceptions about levels of integrity at the institution and the ways in which research standards are communicated at the university.

A movement has been gaining significant traction among a group of scientists over the last decade, calling for improved standards of transparency and reproducibility in research. This movement suggests that a share of the research community desires and is supportive of what is called here, a congruent connection between organizational legitimacy and organizational virtuousness. In 2012, the United States National Institute of Neurological Disorders and Stroke convened a group of stakeholders and scientists to discuss how to improve methodological reporting and the handling of data in grant applications and publications (Landis et al., 2012). This group adopted and recommended a core set of reporting standards for study design, which was later adopted for preclinical studies published in *Science* among other publications (McNutt, 2014). The call for increased transparency from within scientific community began as a result of troubling reports of high proportions of irreproducibility in scientific investigations, leading to a lack of confidence both within the research community and among the public (McNutt, 2014).

A recent survey of approximately 1,500 researchers conducted by *Nature* revealed mixed attitudes among scientists about reproducibility as a crisis, but nearly one-third of

respondents reported their labs had taken corrective actions to improve methodological processes at their research institution within the past five years (Baker, 2016). According to John Ioanndis, an expert in methodological robustness at Stanford University, "the results of the questionnaire suggest that journals, funders and research institutions that advance policies to address the issue would probably find cooperation" (Baker, 2016, p. 454).

This movement suggests support within the scientific community for congruence between the standards and rules required externally of institutions and internal processes and activities in the research environment. Scientists backing efforts to strengthen standards for reproducibility and transparency in research are generally in support of systems that provide scrutiny and are aligned with the daily activities that occur in the research environment. Findings that support a congruence hypothesis would indicate that a transparent system that may require more complexity is necessary to ensure that research is done with integrity.

Hypothesis 2: Independence. Another possible outcome they operate independently. In other words, actions related to organizational legitimacy are not connected to perceptions of virtuousness among organizational actors. In the context of a research institution, exploration of institutionalized rules has centered primarily on the ways in which they prevent and detect wrongdoing of individuals in an organization. This vantage point may differ starkly from the concept of organizational virtuousness, which emphasizes an underpinning of positive deviance and actions and processes that lead to aspirational outcomes linked to desirable behavior.

Meyer and Rowan's Institutional Theory (1977) provides evidence that an intentional separation exists between formal institutionalized activities and actual daily work of individuals in an organization. According to Meyer and Rowan (1977), the processes, systems, and structures within organizations represent myths of their environment in response to social expectations rather than reflections of daily work activities. These "institutionalized rules" should be distinguished from actual accepted behaviors, norms, and daily work within the organization (Meyer & Rowan, 1977). This facade provides a layer of protection for researchers, to allow them to continue with their research activities, while people, systems, and processes function around them on their behalf in order to maintain public trust. For example, a research university's policy on research misconduct may be viewed as a way for the institution to show the public that the organization would have a response in the event something bad happened. Inside the organization, this policy may have little or no bearing on the daily activities and decision-making of researchers.

Findings that support this scenario would suggest that the actions required of research universities to maintain public trust are unrelated to fostering virtuous research environments that promote desirable behavior and decision-making. This outcome would lend support to Meyer and Rowan's (1977) theory that the highly institutionalized, socially constructed, formal regulatory structure that exacts authority over research institutions is largely a rationalized myth taken for granted by the public as legitimate. These rationalized rules and structures are required in order for the organization to be considered "proper, adequate, rational, and necessary, and organizations must incorporate

them to avoid illegitimacy" (Meyer & Rowan, 1977, p. 345). If organizational legitimacy and organizational virtuousness are not connected in the minds of research actors, the regulatory apparatus would be a largely symbolic endeavor, creating enormous burden on institutions and, in essence, a layer of bureaucracy disconnected from actual activity and conduct in the research environment.

Hypothesis 3: Partial Connection. A third hypothesis can be characterized as partial connection and represents the idea that aspects of organizational legitimacy and organizational virtuousness are related and mutually influential in some, but not all, ways. Partial connectedness means that these two constructs, while not fully congruent, operate alongside each other, and aspects of each have the potential to be connected, aligned, or reinforcing to the other. As in the second hypothesis, a conceptual barrier exists between the constructs, but the barrier is permeable in certain areas and contexts. For example, while no connection may exist between perceptions of research actors related to the effectiveness of the data-management policy at the institution and a favorable or unfavorable perception of openness at the institution, there could be evidence of a connection between perceptions of the effectiveness of research support offices at the university and favorable perceptions of trust and collegiality at the institution.

Recent work by Gunsalus (2018), suggests this hypothesis in action and the idea that systems to manage research conduct can and should align with the needs of researchers. Gunsalus (2018) identifies "real world needs" for researchers like choosing a mentor, how to have a dispute professionally, good laboratory practices, and how to get

useful advice when you encounter a problem. She claims that there needs to be improved alignment among these types of needs and institutional challenges like monitoring misconduct, conflicts of interest, and management of the inherent complexities that exist for universities as they seek to create and sustain a research culture that fosters integrity. In other words, tending to culture needs to occur in tandem with implementation of formal RCR rules, and aspects of these constructs need to align. If supported by analysis, the third hypothesis could preempt identification of areas where connections occur and serve as a starting point to harness stronger and more relevant and applicable processes supporting integrity in the research environment.

An essay by a group of distinguished scientists and published in *PNAS* highlights a host of severe problems and systemic flaws faced by scientists working in the biomedical research system and claims that the research enterprise in the United States is on an unsustainable path (Alberts et al., 2014). A major source of this problem, the authors claim, is an imbalance of supply and demand for limited research funding, creating hyper-competition among scientists (Alberts et al., 2014). This group calls for systemic evaluation of federal funding programs, policies, and their implementation, recommending that agencies hire third-party evaluators to do this assessment and make findings accessible and public (Alberts et al., 2014). The authors go on to recommend, among other actions, assessment of programs not only on the basis of how well they are executed at the institution, but on the broader purpose of the policy or program and whether or not these overarching goals are being met (Alberts et al., 2014).

This study explores the connection between legitimacy and virtuousness and could support the idea that the rules and systems (or aspects thereof) created to regulate research environments relate to virtuous research environments. Conversely, evidence could provide support that these constructs have little connection in the context of this study and address different purposes and functions related to fostering integrity in research. Finally, it could support the idea that the two constructs operate in alongside one and other and while not directly connected, they have the ability to support and reinforce each other in varying contexts or when deliberate efforts are made.

Methodology

In this section, I present the design and process I used to conduct this study. The research design is a blueprint for how I addressed the proposed research question and how I collected and analyzed the data in order to draw conclusions. In the following sections, I detail the research design, methods, and data collection of this study.

Research Design

A qualitative research design was used for this study, and data were collected through extensive face-to-face interviews with participants from a top-tier, research-intensive university in the United States. According to Miles, Huberman, and Saldana (2014), "Qualitative data are a source of well-grounded, rich descriptions and explanations of human processes" (p. 4). There is extensive literature distinguishing the many genres within qualitative research (ethnography, grounded-theory, narrative inquiry, case study, etc.), that support various study designs and specific methods used,

but most agree that the focus is on capturing a wholistic view of the context under study, the ways it is working, and its explicit and implicit processes (Miles et al., 2014). According to the literature, a common feature of many qualitative approaches is the assignment of codes and themes to groups of data in order to identify relationships and patterns among variables (Miles et al., 2014). According to Creswell (2003), a qualitative design is typically emergent and refined along the way as the researcher learns more about the central phenomena.

The data derived from qualitative research are in the form of words (Creswell, 2003; Patten, 2002). Meanings are socially and historically constructed, and the investigator seeks to establish the meaning of the phenomena from the views of participants (Creswell, 2003). This approach is appropriate for the present study, because the emphasis here is on the real, lived experiences of individuals and the meanings that they give to the structures, events, and processes around them and to the corresponding connections to the larger social world (Miles et al., 2014). According to Miles et al. (2014), a common feature of qualitative approaches is a focus on ordinary events that occur in natural settings and a strong potential for "understanding latent, underlying, or nonobvious issues" (p. 11). In other words, findings have the potential to reveal complexity, allowing for both theory-building and practical application in the examination of factors that are most important to the promotion of institutional integrity.

A recognized limitation of qualitative inquiry is its fundamentally interpretive nature and, therefore, the potential influence of the researcher's values, attitudes, and beliefs in the collection of data (Miles et al., 2014; Creswell, 2003). According to Miles

et al. (2014), “the strengths of qualitative data rest centrally on the competence with which their analysis is carried out” (p. 12). I used the processes outlined in Miles, Huberman, and Saldana (2014) to approach data collection and analysis systematically. I acknowledged and continuously reflected on how personal biases and had the potential to shape study findings and sought to minimize such influence by careful attention to subtleties in participants’ speech. My aim was to avoid categorizing their comments too readily according to *a priori* constructs (Creswell, 2003).

Institutional Review Board Approval and Ethical Considerations

After receiving final approval of the research from my committee and prior to beginning the data-collection process, I submitted a research protocol proposal to the University of Minnesota Institutional Review Board for approval on March 6, 2019. The study was reviewed by the IRB and, on March 26, 2019, was determined to not meet the definition of Human Subjects Research as defined by the Department of Health and Human Services (DHHS) and the U.S. Food and Drug Administration (FDA) regulations. Documentation of this correspondence is presented in Appendix A. For this reason, consent and recruitment materials submitted with the IRB protocol proposal were not required. Information about the study including the IRB determination, how information would be used, and where to direct questions was provided to participants as a courtesy (see Appendix B).

Data Collection

In this section, I detail the data collection plan including the method, setting, participants, and the recruitment process I undertook for this study. I describe the concepts and variables used, describe the cognitive interview pretest, and present the interview protocol.

Method

A semi-structured interview protocol was used to collect open-ended responses. This method allows for a flexible structure in order to analyze perceptions related to broad, pre-determined concepts, and also allows for elaboration (Gill et al., 2008). According to Miles et al., (2014), qualitative research designs can range from highly inductive to tightly pre-structured, depending on what is what is being examined in the study and what is already known. “Tighter designs are a wiser course for researchers working with well-delineated constructs” (Miles, et. al., 2014 p. 19).

According to Gill et al., (2008), “semi-structured interviews consist of several key questions that help to define the areas to be explored, but also allow the interviewer or interviewee to diverge in order to pursue an idea or response in more detail” (p. 291). This approach is appropriate for this study as it allows part of the data to emerge and captures a view of the perceptions of each individual participant in relation to the data-analysis categories, but also allows for the ability to generalize about the ways in which specific variables interact with, relate to, and influence this view.

According to Creswell (2003), using a qualitative approach, “The researcher collects open-ended, emerging data with the primary intent of developing themes from

the data" (p. 18). Through an interview protocol, the researcher can control the line of questioning and gather descriptive language used by the participants related to the central areas of study. According to Gill et al. (2008), interviews are also appropriate and most productive for exploring particular topics that could be sensitive to discuss openly in a group environment.

Setting

Two colleges within a Carnegie Classified Doctorate-Granting (R1), public, land-grant, research university were selected for this study. The Carnegie Classification system for institutions of higher education is a widely recognized framework in the United States for categorizing colleges and universities in the study of higher education (Carnegie Classification of Institutions of Higher Education, 2015). Three classifications exist within this framework for categorizing research institutions, and doctorate-granting institutions (commonly referred to as R1) are those classified as having the highest level of research activity based a number of factors including: research and doctoral degrees granted, research and development expenditures, number of research staff, and research output and activity per capita. There are currently 115 public and private universities classified as R1 in the United States (Carnegie Classification of Institutions of Higher Education, 2015).

The University used for this study is ranked in the top ten percent among public research universities by U.S. News and World Report (2020) and has approximately 4,000 faculty and 300 research and educational outreach centers and institutes. Federal funding from the National Institutes of Health, National Science Foundation and other

granting agencies including defense, agriculture, education, and energy comprise more than 50 percent of the University's research portfolio. According to the National Center for Science and Engineering Statistics (2017), the institution is ranked in the top 2 percent for earned doctorates and top 3 percent for total Research and Development (R&D) expenditures.

To compare and contrast perspectives on organizational legitimacy and organizational virtuousness, I selected participants from two different types of research disciplines, one that is presumed to be more internally-focused (basic), and one that is presumed to be more externally-focused (applied). From this point on, the two colleges will be referred to as natural (basic) sciences, and public (applied) sciences. A basic science college was chosen to collect data from individuals who conduct research about natural phenomena, often referred to as pure science research. Basic science aims to build on fundamental knowledge about the natural world. The practical application of basic research is not the immediate focus. In contrast, the college representing the public sciences was selected to represent perspectives of investigators and leaders who conduct research that emphasizes practical application and seeks to solve human-centered problems. Research findings are used to improve health, implement new technologies, and address modern societal needs. Both colleges that participated in this study cite research as a strong emphasis of their collegiate mission and are nationally and internationally recognized for research and funding award levels.

Participants

A total of 20 interviews were conducted (10 from each college) among varying levels of departmental research administrators and faculty researchers. Three participants from each college represent institutional' or collegiate-level leadership (VP, Dean, Associate Dean). One from the natural sciences and three from the public sciences are at the departmental-chair or division head or similar administrative level. Three from each college are at the professor level, with the remaining participants at the associate or assistant professor level. Table 1 presents the distribution of participants by research role and college.

Recruitment

I contacted individuals with varied research interests and expertise within each college and also attempted to balance gender and other diversity factors as I was able. Email addresses and information about participants were gathered from the University's web site and college online directories. Email invitations were sent to potential interview participants, beginning with individuals at the university, dean, and department-administrator levels and moving next to faculty researchers. In this correspondence, I informed potential participants about the focus of my study and noted that the research was for my doctoral dissertation. I also informed them that I hoped to meet with them for 45–60 minutes in a location of their preference and provided the time frame for

Table 1: Participants by Research Role and College (N=20)

	Natural Sciences (Basic)	**Public Sciences (Applied)**
Institutional or Collegiate Administrative Leader (Vice President, Dean, Associate Dean)	3	3
Department Administrative Leader (Department Head, Division Head)	1	3
Professor	3	3
Associate or Assistant Professor	3	1
Total Participants	10	10

conducting interviews. I asked that they please reply with times that would be most convenient for them to meet and I expressed my appreciation for their consideration in taking part in the study.

I sent recruitment correspondence in batches of four to six emails for each college and awaited responses for approximately one week before following-up. In the follow-up email, I forwarded the original email, offering to answer any questions they may have about the study. I again asked for suggested dates and times of convenience to meet and reiterated my appreciation for their consideration in taking part.

I responded to each email individually and scheduled interviews of approximately 45-60 minutes with individuals in their offices or locations of their choosing. It was implied in the recruitment email that face-to-face interviews were preferred, but Skype, Facetime, or phone interviews could take place in lieu of in-person meetings when necessary. All of the interviews were, in fact, conducted in-person in the interviewee's office.

A total of 63 individuals were sent an initial recruitment email with a request to interview, 23 agreed to take part in an interview, and 20 interviews took place. Five interviewees declined out-right, and the remaining did not respond, were not able to participate within the interview schedule timeline, or responded affirmatively initially but ultimately were not able to participate because of schedule conflicts. The first interview took place on April 9, 2019, and the last interview took place on June 27, 2019.

I recorded each interview with a digital audio-recorder and uploaded files to my computer and a portable drive. I used Temi, an online digital-transcription software, to

transcribe all interviews from recordings and did a check and edit of all transcriptions. I reviewed all written transcriptions of the interviews and made corrections where inaccuracies or discrepancies occurred and also clarified areas of question or ambiguity. The data collected are stored securely following institutional guidelines of data management as provided by the University of Minnesota Library.

Pretest

Following review from the University of Minnesota Institutional Review Board (IRB), I conducted a pilot-test, cognitive interview with a research scholar with a role and background similar to those of people to be recruited for the study. Cognitive interviewing is a method used to assist the researcher in gathering information about how the questions and data collection may be interpreted from the participants' viewpoint (Knafl, 2008). It aids the investigator in identifying problematic questions or issues of interpretation and helps the investigator to understand the kinds of information participants use in formulating their responses (Knafl, 2008).

I informed the cognitive-interview participant that the feedback collected would not be included in my study. I specifically requested participation as a pilot interviewee and asked for feedback related to the interview protocol in order to uncover possible problems with the protocol. I asked things like: Are the questions sequentially ordered in a logical and understandable manner? Are there general or specific ways the protocol could be improved to elicit more detailed responses? Based on the feedback from this pretest process, I did not modify the protocol, but did decide to offer added context when explaining each framework prior to questioning.

Interview Protocol

Organizational legitimacy reflects the views of the organization of those who are external to the organization (i.e. the public, funders, regulators) with the main elements being fulfillment of social responsibilities and the maintenance of public trust and confidence in the organization. Approaches used to achieve these elements include: a research infrastructure, policies, oversight mechanisms, and education on responsible conduct of research. Organizational virtuousness, representing internal features of the organization, has elements of purpose, trust, collegiality, integrity, and openness. Approaches used to achieve organizational virtuousness include developing shared goals, using positive language, reinforcing positive norms, cultivation of meaningful relationships, rewarding desired norms of behavior, and creating growth opportunities for organizational members. The questions posed to all interviewees are based on these two constructs.

An interview protocol is necessary in order to collect specific data in an organized and planful manner (Gill et al., 2008). Questions posed to each interview participant were based on the study's conceptual framework. The conceptual framework describes elements of organizational legitimacy and organizational virtuousness. Table 2 presents the protocol script that was used to guide each interview.

I began each interview by introducing myself, thanking the participant for agreeing to take part in the study and providing general context about the study. I told participants that I was collecting data about research environments at research universities so that they would begin thinking in terms of this setting from the start. I

provided a one-page informational consent form that reiterated much of the background information provided in the recruitment email about the study (Appendix B).

The form also let participants know that their participation was voluntary and that records of the interview would be kept private and stored securely, only to be accessed by myself and my advisor. The form concluded by providing contact information for myself and my advisor, encouraging follow-up if they had questions after the interview or in the future. I next asked if I had the participant's permission to audio-record the interview. All participants agreed to be recorded.

I ordered the questions intentionally, beginning with an opening section used to confirm participant level and role at the institution (e.g. faculty, department chair, dean, vice-president) and confirm the college and type of research the participant is affiliated with. Interviews with faculty researchers, department chairs, and division heads, deans, and associate deans followed a script that referred to his or her specific college, department, or unit. A separate but similar script was used for the one participant who held an institution-level position.

Following the opening introductory questions, I directed the discussion to focus on the two theoretical constructs, explaining that I would be exploring their perceptions about two aspects of organizations related to the working environment of researchers, one aspect representing the external parties' views of the organization, and the other representing perspectives of those internal to the organization.

Table 2: Interview Protocol

Interview Introduction

Thank you for making time to talk with me today.

As you know from our email correspondence, I am gathering information about organizations and research environments at research universities. I'm interested in how colleges and departments manage external mandates and compliance aspects of research and how this may or may not connect to aspects of the internal culture of a research environment.

Before we begin, do I have your permission to audio-record this interview?

Thank you, I'm going to turn the recorder on now.

To start, I'd like to confirm that I have your permission to audio-record this interview.

Thank you.

Opening

To start, I would like to learn a little bit about your research background and experience at the University.

1. Please tell me, in what year did you get your PhD or research degree?

2. When did you first come to the University?

    a. When did you enter this College?

    b. What is your current position, and what previous positions have you held in the college, in the department, and at the University?

Theoretical Constructs

Today we are going to explore your perceptions about two aspects of organizations. They both relate to the work environment(s) of researchers, specifically the activities, processes, climate and overall culture in your college and department. One aspect we will talk about represents view of the organization by external parties and the other represents perspectives of those internal to the organization.

Table 2: Interview Protocol Continued

I remind you that the context for this conversation is *the research environment* of your college and department.

Organizational Legitimacy

**Hand the interviewee the simplified model (Organizational Legitimacy) that show elements of organizational legitimacy.*

The first framework represents external perceptions of the college. It has to do with the ways in which the public views the legitimacy of the organization when it comes to research. The term public is a broad term here but includes funders, external administrators who monitor aspects of compliance in the college, lawmakers, and citizens external to the organization but with various ties or interests in organization.

What I mean by legitimacy is the view among these external parties that the college and institution is trustworthy and socially responsible when it comes to research. How do these organizations and parties know that the research is trustworthy, responsible, of the highest integrity? How does the organization show that expectations are being met, and rules are being followed in an effort to foster integrity and manage responsible conduct in research.

I'd like to hear what you have to say about organizational legitimacy [external perceptions] when it comes to your college and its research activities.

3. What roles would you say these elements of legitimacy (social responsibility, public trust, confidence) play in your college or department?

   I'm really interested in examples or stories that illustrate how these characteristics play out in your college or department. Do you have any such examples or stories?

4. What kinds of things **foster or promote** these characteristics with respect to your college or department?

5. What do you think are the things that **hinder or prohibit** the presence of these characteristics with respect to your college or department?

6. So, overall, which characteristic or characteristics among these do you see as dominant or most salient with respect to your college or department?

Table 2: Interview Protocol Continued

Organizational Virtuousness

**Hand the interviewee the simplified model (Organizational Virtuousness) that shows the elements of organizational virtuousness.*

The next framework is known as organizational virtuousness. It refers to the internal dynamics of the organization. It also refers to the ways in which your colleges work environment(s) promote (or possibly compromises) goodness and desirable behavior. Organizational virtuousness represents the *perceptions of those internal to the college and department.* It focuses on positive elements such as collegiality, trust, openness, integrity, and purpose that may or may not be prominent in the work environment by those individuals who work there.

7. What roles would you say these elements (collegiality, trust, openness, integrity, purpose) play in your college or department?

I'm really interested in examples or stories that illustrate how these characteristics play out in your college and department. Do you have any such examples or stories?

8. What kinds of things **foster or promote** these characteristics in your college or department?

9. What do you think are the things that **hinder or prohibit** the presence of these characteristics in your college or department?

10. So, overall, which characteristic or characteristics among these do you see as dominant or most salient in your college or department?

Connections

Now, I'm particularly interested in finding out whether or not you see connections between the two frameworks we've been discussing.

**A hard copy of a simple model with both frameworks will be provided to the participant at this time and be used as a guide for discussion.*

11. In thinking about the research environment and research activities of your college or department, do you see connections between the two frameworks (i.e. internal and external elements) we've discussed or are they separate ideas?

Table 2: Interview Protocol Continued

If so, do you have examples or stories to illustrate how you see these two as connecting? How would you describe the connection? Do they influence each other? Are there certain areas that are connected? Can you elaborate?

**Verify the choice they made about connections based on their response.*

Conclusion

12. Is there anything else you'd like to add?

Thank you very much for taking part in this interview today.

For the first three interviews, after providing a brief overview of the two constructs to set the stage, I began the more in-depth description and questioning about the construct of organizational virtuousness. I found that the first three interviewees seemed to more readily understand the organizational virtuousness construct than organizational legitimacy and were able to provide relevant responses and examples to describe their perspectives. In these first three interviews, when the discussion moved next to the construct of organizational legitimacy, participants seemed to need more clarification about the construct and had fewer examples until prompted. They had trouble discussing organizational legitimacy as distinct from organizational virtuousness.

For the fourth interview, I decided to reverse the order of discussion to see if that would help respondents understand the constructs and assist in the flow of the interview. Reversing the order facilitated a more natural flow of discussion. Respondents could easily discuss organizational virtuousness as separate from organizational legitimacy when legitimacy was introduced first. For this reason, I conducted the rest of the interviews in the following order: introduction, brief overview of the two constructs, further explanation and questions about organizational legitimacy, further explanation and questions about organizational virtuousness, questions about connections between constructs, and concluding question. The process I describe next details the interview process using this sequence.

Following the introductory questions and a brief overview of the two theoretical constructs, I moved the discussion specifically to explore perceptions of organizational legitimacy. I placed a figure (Figure 2) of the simplified model of the framework,

showing only the elements of legitimacy, in front of the participant, and explained that this construct represents external perceptions about the organization (college, department, or institution) in reference to research, with legitimacy meaning the view among external parties that the organization is trustworthy and socially responsible in its research. An organization has legitimacy to the extent that expectations are being met, standards are being followed, and people have confidence and trust in the research being done. Beginning with a neutral opening question, I asked generally,

- *I'd like to hear what you have to say about organizational legitimacy when it comes to your college or department and its research activities. What role(s) would you say these elements of legitimacy (social responsibility, public trust, confidence, etc.) play in your college or department?*

The goals of this broad opening question were to see generally where the participant would take the discussion, hear initial impressions, and to gauge comprehension of the framework. Some participants pondered the question for a period of time and responded with more questions to clarify the concept, whereas others responded strongly and immediately. To get participants to expand on this opening question, when needed, I also said,

- *I'm interested in any examples or stories you may have that illustrate how these characteristics play out in your college or department. Do you have any examples?*

This additional question led to the next, more direct question which was,

- *What kinds of things foster or promote these characteristics with respect to your college or department?*

I next asked the question:

- *What do you think are the things that hinder or prohibit the presence of these characteristics in your college or department?*

This question was meant to elicit specific examples and stories about what participants perceive the barriers to organizational legitimacy to be.

The portion of the interview about organizational legitimacy was concluded with a question about which characteristic among those in Figure 2 the participant perceived to be most prominent with respect to the college or department. Interviewees were asked specifically,

- *Overall, which characteristic or characteristics among these do you see as dominant or salient with respect to your college and department?*

At this point in the interview, most participants had provided multiple examples of how these concepts played out with respect to their research environment and had a good understanding of the framework. This question was intended to explore what they deemed to be the strongest element of legitimacy and to elicit reasoning as to why they felt this way.

Next, I directed the discussion to measures of organizational virtuousness. I began by placing a simplified visual model of the framework, a text box on a piece of paper with the five elements (purpose, trust, collegiality, integrity, openness), in front of the interviewee, explaining that the framework referred to the internal dynamics of the

organization. Figure 3 represents this simplified model. I explained that that by internal dynamics, I meant the ways in which the college or department promotes or compromises goodness and desirable behavior and performance in research. I noted that organizational virtuousness represents the perceptions of those internal to the college, focusing on positive elements such as collegiality, trust, openness, integrity and purpose that may or may not be prominent in their own work environments.

As Table 2 shows, the questioning for organizational virtuousness followed the same sequence as did the questions for organizational legitimacy. I asked questions to explore participants' perceptions of the framework to gauge understanding and to elicit examples.

The next question brought the two theoretical constructs together and directly addressed the question of connection. As a guide for discussion, I showed the participant a picture of the two frameworks together, as in Figure 4. I asked the participant to consider the context of the research environment in their college and department. I asked:

- *Do you see connections between the two frameworks (i.e. the external and internal elements) we've discussed, or are they separate ideas?*
- *If so, do you have examples or stories to illustrate how you see these two as connecting?*
- *How would you describe the connection? Do they influence each other? Are there certain areas that are connected? Can you elaborate?*

For the final question of the interview, I asked interviewees if they had anything else to add to the discussion. This offered an opportunity for participants to emphasize

their perspectives on the topics, add information on their perceptions, and make final remarks.

Figure 2: Visual for Interview Protocol: Organizational Legitimacy

Organizational Legitimacy

Social responsibility

Public trust in organization

Public confidence in research

Meeting societal expectations

Figure 3: Visual for Interview Protocol: Organizational Virtuousness

Organizational Virtuousness

Collegiality

Trust

Openness

Integrity

Purpose

Figure 4: Visual for Interview Protocol: Organizational Legitimacy and Organizational Virtuousness

Analytical Approach

Miles et al. (2014) describe the analysis process as three flows of activity taking place concurrently: data condensation, data display, and conclusion drawing. Data condensation refers to the focusing and selecting of relevant data among the full body of information gathered or the "sharpening" part of the analysis where large sections of data are selected and eventually categorized and coded (Miles et al., 2014). During data condensation, data display is also taking place, which refers to the way the data are organized, sorted, and assembled visually, making it accessible to the investigator in a way that can be analyzed.

I began data condensation by creating a self-reflective journal of impressions and thoughts on the interviews during the interview process (Gill et al., 2008). I did this prior to reading through the interview transcripts to acknowledge both my initial reaction to the data and any preconceptions I might have. Once the data were transmitted, I listened and read through the interview transcripts, making high-level notes on connections and correcting discrepancies to gain a comprehensive understanding of all responses and begin the process of categorization. Following this analysis, I reviewed each interview a second time, identifying the main ideas expressed by each participant as well as critical points within each interview.

The raw data were extracted from the transcribed interviews and put into a master Microsoft Word table with six columns for organization and sorting. The data were organized into the following six columns: index number, speaker number, time stamp, question code, theme code, data content. Each instance of speech was assigned its own

index number so it could be easily located if necessary. Time stamps provided a direct URL hyperlink to the corresponding section of the audio recording.

As I populated the master Word table with the data, I also began coding the data by question. Simultaneously, I began to develop a separate, corresponding data definitions table with broad groupings of common ideas and responses, organized by question. According to Miles et al. (2014), the second stage of theme refinement is referred to as "pattern coding." I continued to refine and combine category descriptions and groupings as I reviewed and coded the data by question in the Master data table. This process of pattern coding lead to the emergence of defined themes. The process of organizing and reviewing the data by question ultimately lead to the development of four to six theme codes for each question. I added the theme codes to the master Word table once I had fully refined and defined each code.

After the coding process was complete, I sorted the data by theme code for each question. Next, I created a table for each theme code, assigning the specific data index numbers used to support each themes in order to confirm the analysis and begin the process of drafting the findings. In the final step of coding, referred to as "magnitude coding" by Miles et al. (2014), when possible, I noted the frequency and intensity of responses with general descriptors in order to capture consistencies among the interviews and also avoid making claims that could not be substantiated by the data.

Conclusion drawing and verification represent the final flow activities that occur as data were condensed and organized. As data were being analyzed, conclusions were considered in a flexible and open manner, according to patterns, explanations, trends, and

propositions. Final conclusions did not generally emerge until all data were analyzed and were verified by referring back to original transcripts and notes. I noted narrative outcomes following my analysis and generated interpretations and meanings with reference to the theoretical concepts used to frame the study. Themes and data categories are addressed in a narrative that draws conclusions about the participants' perceptions of the theoretical concepts and relationships between theoretical concepts.

All participant responses are presented verbatim from the transcripts except as noted here. Participants' identities have been protected in the narrative; phrases, comments, or references that have the potential to identify the interviewee have been restated in a generic way that maintains the integrity of the data. Ellipses are used to indicate where a response is abbreviated for clarity. Conversational idioms (e.g., um, uh, like) were also omitted to improve readability but only where the integrity of the data could be maintained.

In conclusion, the two-fold purpose of this study is to explore perceptions of organizational legitimacy and organizational virtuous among members of a research university who actively participate in the research process, and to explore whether or not these research actors perceive a connection between the two paradigms. This study provides a new way of examining the relationship between the research integrity regulatory structure and aspects of the internal research environment.

CHAPTER 4

RESULTS

The literature on research integrity in academia has focused largely on the study of individual behaviors and the development and implementation of systems and regulations that respond to those who act inappropriately. There is less exploration of how these rules and systems influence or connect to what occurs in the research environment, how they are perceived by those who are conducting and administering the research, and whether or not they promote or hinder desired conduct and performance in research.

This study examines the research question: *How do researchers' and administrators' perceptions of the formal actions taken by a research university to achieve organizational legitimacy relate to their perceptions of the factors that represent organizational virtuousness in research environments at the institution?* This question is framed by two theoretical perspectives: organizational legitimacy and organizational virtuousness, reflecting external and internal elements that shape systems, processes, and actions related to research integrity at research universities. Organizational legitimacy reflects the formal actions and compliance-centered structures of the institution that are used to legitimize the research activities to its external stakeholders. Organizational virtuousness reflects the positive characteristics of the internal research environment that contribute to desirable conduct in research and a culture of integrity. The purpose of this

study is to explore perceptions of these two frameworks and possible connections between them.

This chapter presents findings from interviews with 20 faculty researchers and research administrative leaders from two research-intensive colleges within one Carnegie Classified Doctoral-Granting (R1) University: one college representing a natural sciences (i.e. basic) discipline, and the other representing a public social science (i.e. applied) discipline. It presents a description of study participants, findings related to the two organizational frameworks, and perspectives and analysis on connections between the frameworks.

Study Participants

Of the 20 participants interviewed, 10 are from the public sciences and 10 from the natural sciences. Twelve of the interviewees presented as female and eight as male, and they are estimated to range in age from their 30s through 60s. The distribution of research roles is as follows: four are assistant or associate professors, six are full professors, four are departmental-level research leaders (department or division head and also professor), and six are college or university-level research leaders (vice president, dean, associate dean). Every role is represented from each discipline. Most interviewees who are full professors, or in department administrative leadership roles, and collegiate leader roles have served in various leadership capacities during their tenures at the university.

Perspectives on Organizational Legitimacy

To begin the interview, I thanked each participant for taking the time to meet with me and reiterated the message from the email invitation that I am gathering information about organizations and research environments at research universities, with particular interest in how universities manage external mandates and regulations surrounding research and how this may or may not connect to the internal aspects of research environment. I then began by asking some opening questions to confirm their research role, length of time at the institution, and areas of research expertise.

Next, I outlined the organizational legitimacy framework, showing the interviewee Figure 2 with the four characteristics: social responsibility, public trust in organization, public confidence in research, and meeting societal expectations. I explained that the framework represents the ways in which external audiences and the public view the organization's research. I noted that the word "public" is broadly defined to include funders, federal regulators, lawmakers, as well as the general citizenry, and the term "legitimacy" reflects the view among these external parties that the organization is trustworthy and responsible when it comes to research. Policies, processes, systems, and an operational infrastructure that supports research compliance are all formal elements that legitimize the research activities and institution in the eyes of external stakeholders.

To assess understanding of and initial reactions to the organizational legitimacy framework, I asked the opening question, "*What role would you say these elements of legitimacy [public trust in organization, social responsibility, public confidence in research, meeting societal expectations] play in your college, department or the*

organization?" Responses to this broad question emphasize themes of credibility, stewardship, neutrality, and responsible practices.

More than half of the respondents characterize the idea of organizational legitimacy using words like "central," "foundational," or "important," connecting it to a larger social responsibility and the mission of the institution. A research leader in the public sciences said, "I think that social legitimacy…organizational legitimacy is the bedrock, fundamental foundation stone for what we're doing here with respect to research." A professor in the natural sciences tied it to mission saying, "…to my mind all of these are extremely important aspects of what we do, particularly since we are at a land-grant university." An associate dean in the public sciences also referenced mission saying, "…when I see…social responsibility, I think we feel a very strong attachment to the land-grant mission here – that we need to give back to the university, to the community, to the state. We need to translate our work and get our work out there to make a difference."

Social responsibility with specific reference of the role of researchers as stewards of public funds was cited by several participants when asked about the role of legitimacy. One assistant professor in the applied sciences said,

> "I'm also very acutely aware of the fact that my funding comes from taxpayers and that I feel a responsibility because of that. I feel a responsibility when I talked to my parents or my aunt or whoever it is. They're paying part of the work that I do… I feel as though I – it's not just about me and my research. It is about people putting trust in me and resources behind me to do their research. And that's, that's

> weighty. And I try and be really thoughtful about that. Is that the social responsibility?"

Elaborating on the idea of being financially accountable and fiscally responsible in the use of tax-payer funded research, a leader in the public sciences said:

> "Another part of it is financial stewardship, which is to say, if someone, National Institutes of Health or the state legislature or a foundation gives us money, we're using that money appropriately. If the money is to fund a certain research project, we're not using it for something else… we're not having a party. We're not being silly. We're not siphoning money to do another project. That the money we're taking in is being used appropriately and it can be audited….there's transparency in that transaction."

Federal funders like the National Science Foundation and the National Institute of Health are also research regulators. Meeting the administrative compliance requirements of funders contributes to credibility of the researcher and the legitimacy of research done at the institution. A dean in the natural sciences put it this way:

> "I think that we've seen, and not just at this university, but in higher ed. generally…a proliferation of compliance requirements for research, for good reasons…I think we have all sorts of…administrative checkboxes that need to be considered and requirements that need to be fulfilled. Everything from…everybody, including me, having to fill out annual conflict of interest statements, lab training and safety training to safety audits of the lamps. I mean, it encompasses everything that we do…I think when people submit grants, there are

> a whole bunch of sign-offs that have to happen to make sure everything is in compliance, both financially, but then also ethically and, and scientifically. And I think we spend as an organization… an increasing amount of resources to fulfill those compliance requirements."

The appearance of neutrality was an area of emphasis among some participants when asked about the role of legitimacy in the research environment. Approaches to research that differentiate research from advocacy are necessary to fostering public trust and confidence. An associate dean in the public sciences put it this way,

> " [What] we work really hard at is trying to differentiate our role as researchers and our role as advocates….because it's both. Like if you're going to do research, you've got to be open. You may be testing a hypothesis, you may have an idea, but also…by definition, you don't actually know what the answer is going to be and you've got to be open to not getting the answer you think you're going to get… And it's important that we explain our research and we conduct our research in a way that we can say, 'No, we were actually ready to be wrong.'"

Sharing a similar sentiment with regard to legitimacy elements being tied to the credibility of the scientific processes and the reporting of findings, a research leader in the public sciences said,

> "There are several parts to that legitimacy. One is offering, to be simple, legitimate or verifiable science or scientific knowledge. The research we do has a result, whether it's in education or health or anywhere else. And that can be trusted to the extent that any scientific project can. And my understanding of the

> science in my own work – usually it's never one study that's decisive, but…together, the work that we're offering to the public, funders and others…forms a portfolio that is trustworthy… and sharing that work that is somehow verifiable through social norms, professional norms, data sharing, whatever it might be."

Activities related to how data are analyzed, stored, shared, and communicated are another important component linked to the legitimacy of the institution. According to one research leader in the public sciences, legitimacy is tied to the way research is managed:

> "We maintain data on our data security in our data control and data distribution. We recognize that. And I've said this directly to people: we live and die by our… data. If we ever get a reputation for not taking data seriously, it will shut us down."

Legitimacy means different things to different external stakeholder groups. Funders are often considered part of the academic community because of their level of understanding and central role in the research enterprise. A funders' idea of credibility may differ greatly from those of lawmakers and the general public. Describing this distinction among external stakeholders, a professor in the natural sciences said,

> "Funders are…basically academics, are academically knowledgeable. They're…not always insiders, but they work hand-in-hand with academics…They understand us, they understand our culture, they understand what we do…I think what we do to that audience with regard to establishing and maintaining legitimacy is the same thing we do with the audience of our science. That

> is…making sure that what we do is done properly, that experiments are not biasedly established or biasedly interpreted, that data are publicly available."

The size, status, and overall reputation of the University as a large, land-grant institution with a comprehensive research portfolio convey legitimacy to funders and the external research community. According to one research leader,

> "I think for our funding agencies, having the University name carries a lot of weight… There's some implied value in just having that name…For instance, on any grant review, it almost seems like a cursory review of the environment where if you just say, I'm with the University, and I think this would be true at most really large R1 universities [in the Carnegie Classification]…The assumption from funders or grant reviewers is that that's good…I think that's partly just the size and scope of the research that happens across the university and our deep history of doing research."

Sharing a similar thought about the size and scope of the institution offering a sense of legitimacy to external parties, an associate professor said: "…It's an enormous institution, and I think that lends legitimacy to what we do here. That it's not some sort of fly-by-night…The sheer size of it…adds some legitimacy to it."

For the more general public stakeholders who are removed from the daily activities and complexities involved in the scientific process, legitimacy is less about administrative systems, rules, methods, and rigor and more about how the research can be applied, is useful, and is responsive to community or individual needs. A division head in the public sciences differentiated between funders and the general public in this way:

> "The legitimacy assigned depends upon the stakeholders…I think our funders…we're very successful in securing funding from NIH …So I think that we're seen as …methodologically sound, scientifically productive researchers…I think that we have a lot of legitimacy with the scientific community, funders, as well as our contemporaries…I think where it falls down a little bit … we sometimes don't fulfill our land-grant-university mission, which means that we should be kind of a public good answering the most pressing questions."

Conveying legitimacy of the organization and of research to the more general public stakeholder group is of growing importance. More than half of interviewees emphasized the growing importance of interacting with the public and communicating in new ways in order to facilitate trust and confidence in research. An associate professor in the natural sciences said, "There are a number of people within this department…that have very public personas, where they're very involved in science outreach activities. And I think those also… help foster a view of legitimacy of research that goes on here." Talking about the importance of communicating with non-scientific public stakeholders, a professor in the natural sciences said, "I think the university, the college, and higher education in general is…putting a greater premium on communicating what we do to non-specialists in ways that we hadn't done…20 or 30 years ago." According to a professor in the applied sciences, trust can be strengthened between the general public and research community if more communication and interaction take place. This professor said,

"…I think that we could do more of where we actually try to share with the public what it is we do, and how we do it, and what does it mean… I think…it's an opportunity to instill in the public even more of the trust of what's going on."

Promoting Organizational Legitimacy

The opening discussion about organizational legitimacy established a foundation for participants to think about specific examples and activities at the institution that foster organizational legitimacy from the view of external stakeholders. To this end, interviewees were asked next more explicitly, *"What kinds of things foster or promote organizational legitimacy with respect to your college or department?"* Responses to this question fell into two broad categories: rules and standards of practice, and direct experiences with external stakeholders.

Rules and Standards of Practice

Responses relating to standards of practice encompass the ethical and practical considerations and decisions made by investigators in the day-to-day process of conducting research. Standards of practice are the rules required by those individuals or governing entities who are external to the research environment. Translation and implementation of these rules can vary greatly, but participants mentioned documentation, training, expertise, and methods taken to ensure responsible research as

central actions that contribute to the legitimacy of the organization, with particular emphasis on funders and peer reviewers of research.

Funding and Peer Review. In nearly all of the interviews, participants named external funders and peer review (for scholarly journals) as being the most influential systems representing the public interest in ensuring responsible practices in research; however, many of these same interviewees also perceive the general public to be likely unaware of the many requirements and safeguards in place as a result of these two systems. Nonetheless, knowledge of a system of rules, safeguards, and oversight is a crucial aspect of legitimacy among the general public.

The funding and peer-review systems serve as check-and-balance systems that are mutually supportive in assuring standards in research practices and responsible stewardship of public funds. When asked what systems and processes exist in the environment to ensure quality in research, a professor in the public sciences responded,

> "I think that's largely tied to publication and funding. I mean, part of what you're going to need to have are research publications that demonstrate what you're doing, why your work is important, and within that process you look for… scientific quality…Now you can always again fool that…it's with those papers then that serves as the basis for, you get more funding? … I have to show progress, I have to show my ideas merit additional research."

Explaining the complexity and influence of the two systems, an institutional leader described the peer-review process as an informal scientific process, and the

funding system as a highly formal process that requires a corresponding compliance infrastructure at many levels of the university to ensure responsible practices.

> "The first one is trickier because it's more informal. This is the system of peer review…peer review is an informal system of …scientists looking at someone's research output and even research practice and saying, 'Yes, this meets the standard.' That is a system for which there is no one really being paid. So that's why it's informal. The monetary [external funding system]…is highly formalized. There [are] accountants and there are …people who really track every penny. And this goes to training of people who receive money, investigators themselves, to their department heads and ultimately to people like….the vice president for research who has the ultimate responsibility for compliance with respect to money."

Track record and reputation with funders are critical to maintaining legitimacy. According to an assistant professor, "It's really about productivity and being able to show a track record of delivering on what we said we were going to do. And that's measured by publishing papers, publishing policy briefs, going to conferences all over the world." Providing another example of this idea, a researcher in the natural sciences said, "Typically if you want to get more funding from NSF,… and you should make sure that the data you generated in the previous grant has been released, because that's something they'll go back and check."

Others mentioned activities like required training or spending the funding the way you said you were going to, and providing required reports in a timely manner. Overall,

building a trusting relationship with funders is critical to receiving continued funding and overall legitimacy from these external entities that represent the public in the use of tax dollars for research.

In contrast, a small subset of participants noted that they perceive the influence of funders and reporting requirements as important but less direct when it comes to actual decision-making in conducting research. A research leader in the natural sciences said, "I think it's kind of neutral. They raise awareness…they're sort of getting us to… articulate these things. And the more you speak about them, maybe the more they are a part of your conscious." According to some participants, the strongest influence is that scientific discovery is a self-correcting process that ultimately plays out in peer review and publishing. When papers are published, methods and findings must be presented. Scientists may be fallible, but if the process of discovery is in error, it will ultimately self-correct. A research leader explained it succinctly in this way,

> "It's the test of usefulness. If something is important…the bottom line is, does a piece of work that we publish have legs? Can people build on it? And that's what I look at as a scientist…So if something is a really exciting finding, and it's wrong…or made up, …it will be figured out.

Expertise and Training. The training and expertise of researchers was another theme that pervaded responses about promoting organizational legitimacy. A division head in the public sciences described the college as being "scientifically sound." When asked how funders or others external to the organization know that they are scientifically

sound, this participant responded that it is about being seen as experts in the field in a number of ways, including but not limited to contributing to the literature:

> "We follow sound scientific principles, and we're innovators on methods…and the application of those methods. So we innovate and we apply.... and I think that they see us as very talented, productive.... We publish a lot…we get invited for professorships, we are seen at national meetings. We get a lot of airplay in the media."

The perception of specialized expertise coupled with the formality of academia is all part of creating legitimacy in the eyes of those external to the organization. Explaining this idea, an assistant professor in the public sciences said,

> "I think within academic institutions, and this is definitely not unique to my department, but some of the titles that we use, the hierarchy, I think all of that is meant to carry a sense of legitimacy. …I was just in a meeting yesterday with our lead fundraiser person for the [college], and he was talking about how he never, ever refers to the faculty [members] by our first names. He uses Dr.,…because that carries a lot of weight with potential donors. That gives us a sense of legitimacy."

Relating to the theme of expertise and standards of practice, the rigorous training and education of future researchers was another area mentioned by multiple participants that lends credibility and legitimacy to external stakeholders. A research leader in the natural sciences said,

> "So for the graduate students, they all have to take a one-semester, once a week ethics course….So we kind of assume…that they understand about plagiarism, about authorship…It's [a] sort of interactive class. It's scenarios and…they get in small groups and present a scenario and work through it... a lot of gray-area stuff."

Principal investigators play a critical role in training and preparing the researchers on research teams. An assistant professor said,

> "The lab should really encourage and guide the training and also, for example, some critical thinking about how to design controlled experiments. So this type of thinking is that it's a PI's responsibility to train the personnel…The experiment-design training from the PI side is also very critical."

A professor in the public sciences also talked about the institutional peer review process for graduate thesis work that, in some ways, mirrors external peer review, as being an important training ground for researchers and also promotes openness and responsible practices in faculty research. Through this process, the practices used by graduate students, who are working directly with faculty members on their research, become open to others on the committee:

> "I've been impressed by overall committee membership of student research and oftentimes faculty research involving students which results in degrees, makes for more open review of that research. So as a professor, I may be doing research on such and such project, but because I have multiple students also working on it,

> they're getting their graduate degrees around that research. There is an open transparency there that might not otherwise be there."

Documentation. Documentation of research methods and practices in response to a growing emphasis from funders and journals on the reproducibility of results is an area frequently cited as being critical to organizational legitimacy, in particular from participants in the natural sciences. Discussing the recent focus on reproducibility and the impact this focus is having on research practices, a dean in the natural sciences said,

> "Research results…[are] certainly something that's received a lot of attention recently, both within scientific circles but then also from the public. And I think one thing that a lot of the scientific societies…are concerned about and how we address that…as far as it changing at the university per se, I don't think I've seen anything explicit, but the journals that we publish in are taking steps to try to ensure reproducibility and publishing raw data and all of the things that can make it possible for people to reproduce results…I think it's the kind of thing that has to happen at multiple levels."

In contrast, an associate dean in the public sciences feels that there should be more focus from journals on the documentation of methods and that they have moved away from expecting the level of detail they once required, which is what is ultimately causing replication problems. This participant said,

> "The methods section should be a roadmap. Somebody should be able to read your methods section and understand what you did and be able to…between that and carefully selected appendices… replicate what you did… Journals are

> backing off on that and they don't want all of that detail. … I think some of our replication and reproducibility crisis is because we don't take the time necessarily to document everything."

Tools and processes to promote a sound laboratory record were cited by two assistant professors in the natural sciences as being critical to legitimacy in the scientific community as it relates to the ability to reproduce results. To this point, one said, "The lab record is important… If someone leaves or other people take over the project, they should go to the lab records and be able to reproduce or you won't be able to do something very similar." Electronic lab notebooks were cited by both junior faculty members as a way to ensure proper management of data and documentation of processes. Detailing the use of electronic lab notebooks, one said,

> "Since I've started, we've been researching electronic lab notebooks as a way of keeping track of things. And part of that for me is motivated by this new digital age where a lot of the research we do is on the computer."

This participant went on to describe how new technology allows for more control and management of data and provides reminders around standard operating procedures, but, at the same time, presents other unanticipated challenges:

> "And now that we're on the computers, really everybody in the lab takes their lab notebooks home every day on their computers. And that terrifies me a little—a lot,…I am trying to get [college] support for helping to fund this electronic notebook platform that we have found that we've been testing that is really great….What that does is it allows you to have your standard operating

> procedures, and when someone in the lab is running a protocol, they would just pull up that protocol. You can easily make any changes that you've done and then you save it and then it's archived. So any notes and what date you did it, it's in that system. And then I can see that that person ran that and that's associated with that data set."

Related to the processes of managing data in the lab, researchers also talked about the mandate from funders to make data publicly available once the study results have been published, and the complexities around doing this. One assistant professor said,

> "How we manage the data in the lab…it's just become even more complicated–when to release data, how to release data. That's sort of right now up to the individual researcher to figure out how to make the data publicly available for most of the NSF or NIH funding. It has to be public at some point, once you've published it."

Other researchers in the natural sciences listed requirements of federal agencies and high-ranking journals, such as securing permits for use of public lands, or providing authentication documents of reagents used in controlled experiments, as all part of the process to maintain positive and productive relationships with external entities and in turn, promote legitimacy of the research. One scientist said,

> "We need to secure permits to work on these public lands, to gather materials from the public lands, so we always make sure that we have those with us….and we typically get them very quickly. I think that this also reflects the respect that

> we've developed from those parameters… both government agencies and Nature Conservancy."

Another scientist described the authentication document in this way,

> "An authentication document describes all of the reagents that you're using and the reagents that you're generating in your research lab. So, for instance, if I'm making a cell line and I'm genetically engineering something…or I modify the genetic code in any way, then I should still make sure that the cell line is what I think it is. So there are some validation steps that everybody should be taking….By submitting a grant, you're pointing out what you will do to make sure that the reagents you're using are…correct and do what you think they are doing."

When asked if providing this level of detail was appropriate, this same scientist responded,

> "I think it should exactly be at that level, because a lot of people have not done that in the past. So, you can genetically modify the genome of cells today with more ease than 10, 20 years ago. And it's relatively easy to validate that you did what you intended to do. But there has been a lot of controversy with certain results that use cancer cell lines and they are intrinsically unstable, so they kind of change all the time. At the very least I think the research lab should keep an eye how they change and what happens over time. Because if I talk about a particular cell line that I use in the lab and it is intrinsically unstable, then that may be very different from the one that my next-door neighbor uses or somebody else. So

those are things that have become very evident in the past five to ten years where there are problems with reproducibility."

Institutional Safeguards. Another area of compliance frequently discussed by participants were the formal laws relating to the protection of human subjects in research, conflicts of interest, lab safety, conducting animal research and other regulatory measures. These rules are less about scientific methods per se, but are often described as safeguards carried out by the institution that pertain to the integrity of research in other respects. An institutional research leader and professor in the public sciences summarized institutional safeguards in the following way:

> "I think there's another layer here which is…formal laws and rules, which…includes things like the Institutional Review Board for protection of human research subjects, FDA rules, there're all kinds of rules about how we use laboratory animals of all shapes and sizes, rules about lab safety equipment in a chemistry lab, and all sorts of other compliance issues…These aspects aren't really the scientific peer review. They're not the money. This is another bucket of all kinds of things. And that is also easier…to assure compliance. We have people going around and checking, we have training, IRB and everything else. So it becomes almost a tapestry of compliance concerns that [this office] and other institutional offices work to promote and ensure."

Responses related to institutional safeguards most often came from participants in the public sciences and emphasize the care for human subjects in research. An assistant professor talked about the Institutional Review Board (IRB) as a necessary system to

prevent mistreatment of populations and a widely accepted part of the process among researchers with whom she interacts with:

> "It's all of the institutional safeguards that we have in place legally and for moral and responsibility reasons. I think that IRB is well respected and people trust the IRB that they're doing their job. I think as a researcher, I sometimes don't know that I've ever felt any major complaints myself, but I sometimes hear them from my colleagues that it's so much process and especially when most of the research we do tends to be exempt. But I think there's still an understanding among everyone that that has to be in place."

This same interviewee went on to talk about how care for human subjects is a critical part of their training as a researchers:

> "I think that it becomes infused in the training that most of us get who ended up working in [public science field]. And I think it makes us really mindful, and I think I also focus a lot on vulnerable populations. And for all of those reasons, I appreciate all of the safeguards in place. I think they're really important."

Two additional interviewees mentioned the necessity of human subjects protections as a result of past failure. One professor discussed the importance of researchers not viewing these safeguards and oversight systems as obstacles, which she often hears, but rather understanding why they exist and the history of their necessity to rebuild public trust:

> "It's like really understanding the roots of that…regulation or whatever. So you understand why is this important in changing the attitude, rather than this is one

> more obstacle….Our systems have failed and therefore we have some work to do to regain the public trust."

In talking about the rules and mechanisms that exist to protect human subjects in research, including things like data-use agreements, and whether they play a role in legitimizing the institution from the public's perspective, a leader in the public sciences said,

> "I hope they're appreciated. I hope they realize people adhere to these to the best of our ability. I know those might seem onerous to some people, but all of the human subjects requirements have a purpose, and they have an origin in egregious abuses of the population….So…I think those are valuable."

Direct Experiences and Interactions with the Community

Communicating and interacting with the public directly is a central component to promoting trust, confidence, and fulfilling social expectations and responsibilities. The next most frequently discussed category of responses about promoting organizational legitimacy relates to direct interactions and experiences between researchers and the community. According to nearly all interviewees, the ways in which the general public "experiences" the University, either through research or in other ways of learning and building awareness, is directly connected to their perceptions about the legitimacy and credibility of the organization. A professor in the public sciences emphasized the ways that researchers, on behalf of the University must often build trust with community groups in order to overcome negative experiences of the past: "There's a lot of people that

are doing incredible work and building trust in this University and in this college and in our division by being good partners. Good, virtuous, open partners."

Another group of participants cited coordinated media communication from the institution as being an important part of interacting with the public. One assistant professor said, "I think having kind of a public-facing arm via interaction with the media or social media or having events, anything to make what we do known to the community, kind of world-at-large as part of that." An associate dean in the public sciences expressed a similar sentiment, emphasizing that the college tries to communicate about the quality and rigor of research as well as the findings:

> "We work hard and through our communications group to make sure we communicate what we are doing, but also communicate in a way that that shows, not just that we're doing it and they we are finding things, but we're doing it in a solid way. We're doing it in a scientifically rigorous way."

Community Outreach

Examples of outreach like farmers markets, public talks, and volunteer opportunities were named by participants from both disciplines as ways they directly interface with the community to build relationships and communicate research, tending to aspects of social responsibility and social expectations. For example, a department head in the natural sciences said,

> "Many of the faculty give public talks and public presentations as part of an outreach or a broader connection. They do it on their own. They do it not because

> I asked them to do it; they do it because they're interested in the area. They feel it is part of their responsibility."

According to a professor in the natural sciences, directly involving people in fieldwork as well as interacting and doing hands-on education in public spaces or at events builds legitimacy:

> "We sometimes involve volunteers in some of our field work…and that's always an upbeat and gratifying interaction…There's a program that was launched by some graduate students on this campus probably eight years ago…where different groups take one day in the summer to… staff a table at one of the farmer's markets and meet with the public, talk about their work, and have some hands-on activities to illustrate the work and so on."

Outreach efforts to improve communication between academia and the general population or "non-specialists" should emphasize direct relevance to the needs of local populations. According to one social science professor, lawmakers have played an important role in bridging this gap:

> "The college has outreach efforts to basically try to communicate….They have people going out into schools, going to farmer's markets, trying to get direct interaction with non-specialists. There's a human face to what we do. I think they're doing a better job trying to publicize what we do to non-specialists or even beyond our traditional audiences of academic and industrial researchers and are…trying to be able to put what university researchers do into words that non-specialists can understand. I think there's a shift at play or there is greater

> discussion about doing research that is relevant…that is perceived by citizens…as being more directly relevant to citizens in [this state]. And you know, that's partially due to lawmakers."

Illustrating this shift with an example, an associate professor noted that funders like the National Science Foundation now often require an outreach component and grantees are asked to report on the ways in which they have worked in the community with regard to the funded study.

Barriers to Organizational Legitimacy

Interviewees were asked next to think about the barriers to organizational legitimacy that exist in the organization and in the research environment. To this end, the next questions posed to participants was, *"What are the things that hinder or prohibit the presence of the characteristics of organizational legitimacy in your institution, college, or department?"* Responses to this question elicited similar themes relating to standards of practice, institutional safeguards, and communication with the public, but emphasizing how they can also play out as barriers when they do not exist, are not appropriate, or are miscommunicated.

Overwhelmingly, participants cited lack of effective communication or miscommunication with the public as a barrier to legitimacy. Similarly, mistrust among the public is attributed to poor or sloppy standards of practice and irresponsible conduct in research. Participants also cited ambiguity of policy at the institutional level and lack of or inappropriate mechanisms to respond to or prevent questionable research practices

as barriers to legitimacy. Finally, the ripple effect of a highly publicized negative event or crisis related to the University, irrespective of its relationship to research, contributes to perceptions of mistrust among the public.

Oversimplification and Miscommunication

The absence, or ineffective responses of communication is a broad theme with a range of dimensions relating to the public's expectations and understanding regarding the role of academia and research. Some interviewees emphasized a lack of understanding among the public about the research process, coupled with changing expectations perpetuated by media oversimplification or misinformation, as the crux of the problem. Describing the range of complexities that relate to the public and its understanding of research, an institutional research leader said,

> "I think the barriers are [that] what we do as research scholars is very complicated. It's not a straight forward 'change the car tire and see if the car tire works.' We're doing creative work. We're doing work in our labs where no one else is looking. We're doing work with other people's money. We're doing work with human subjects and animals that is so subtle and sometimes so private. It's hard for people to know what we do, even if they are interested. So that's one of the things that's just sort of subtle and quiet."

Describing the limited view of those who are outside academia as it relates to being a faculty researcher, this interviewee went on to say,

> "Not many people know what we do. When I've gone through my life and I tell someone I'm a professor at the university, the first question is 'What do you

> teach?,' Which, as you probably know, is a very small part of my job, at least formal classroom teaching. So they don't usually think, as a research professor of, what do you study? What is your research lab about? …what are you doing in the field?"

According to about half of interviewees, the tendency of the media to simplify research for a general audience fuels misperceptions about what the research process actually is, and, in turn, creates mistrust and skepticism. An associate dean in the public sciences said,

> "I haven't liked this trend over the years. The push to publish or, or to publicize findings and without proper context…and what I see is people will say, 'Oh yeah, today is: Don't eat butter. Tomorrow it's: don't eat sardines'…There is… a tendency to…push every finding out there without saying what is the body of the evidence…and so people get weary and they keep seeing variation."

A senior associate dean in the public sciences said it is part of the researchers responsibility to be communicating better what research is, but also what it is not saying: "I think the other thing we haven't done that's causing a lot of trouble right now is there's this idea that one study can prove something and that's just not how I was trained. No single study proves anything." A division head in public sciences also put it plainly, "Often the messages get simplified when they go out to the media. So I think that can destroy people's trust in the research process."

Using the word cynicism to describe the view of the public, an associate dean in the public sciences sees the problem as non-scientists not understanding that researchers

are building from previous findings and looking at only a very small part of the picture each time to assess patterns and trends. In this participant's view, investigators are being pushed to communicate findings too quickly or in a context that does not lend itself to the complexity of the process:

> "People don't realize you never give up. You know, if we tested smoking and lung cancer…we've never proven that. There's no way to prove it. We simply put forth the null hypothesis and we keep rejecting it over and over and over. It doesn't matter how far you get. You'll never prove it. People don't necessarily get that or they don't get probability."

Emphasizing the need for researchers and institutions to communicate these complexities better, a dean in the natural sciences said:

> "I think what sometimes undermines public confidence in research is a lack of understanding that research is where we're changing what we know. And that's why it's research. And so when you give – this is particularly in the area of say, lifestyle and health, right? – You give people advice on how to live, what to eat, what to do, how much to exercise, and then a new study comes out, and the advice changes that. I have seen this really undermine trust in the research endeavors because they will, 'They just told me I shouldn't eat eggs. Now they're telling me I should.' I think partly it's – we're maybe not as good as we should be in explaining how research works."

Some interviewees noted that when research is intertwined with other personal or religious beliefs, or people have heard sound bites in the media, they more quickly come

to their own conclusions. Speaking about the complexity of communicating what research is and why it is needed, particularly in areas of study that may be controversial, a dean said,

> "I'm speaking as a biologist and a natural scientist, a lot of the work that we do is very technical. It can be very difficult to explain to the public and so you can get a reaction to the work that…cause[s] people not to trust the institution. An example, something like GMO's, right? And you could get somebody who's not happy with that technology, creating a stir about how hazardous…GMO research is without maybe any scientific basis. But then, if they raise…the alarm that, 'Oh, this university is doing work in this particular area.' We've had issues with fetal tissue…where the legislature was not happy about. It's things like that then I think can erode trust. But…you have to balance that, that need to have academic freedom…to do research that is fulfilling all the legal requirements. We're not talking about doing things that are unethical or illegal, but if some of the work has, for whatever reason, been controversial in the broader public's eye, I think that can erode trust in [the] institution."

Another topic related to the complexity of research that was mentioned by more than one public scientist is the lack of understanding among the general about the basic need for data, and balancing this with the safety of human research subjects, in order to have rigorous, research for the greater good. To this point, a division head said,

> "What is the role, that greater good, [that] you get from a collective resource? …Like a cancer registry, like birth records, like death records, like hospital

> discharge. And that's much more tightly controlled. It probably should be, but at some point, to understand the health of a population, we need information, right? And if we only get it from a small segment of the population, we're going to have poor policy being made. So …I think a function of the public's lack of understanding about how science works… it's a real problem, you know this lack of public awareness of the importance of having some public pain."

Polarization and Skepticism

Contrasting the sentiment put forth by some participants related to expertise playing a role in promoting legitimacy, another group of participants conveyed the idea that a lack of respect for experts and the research profession also exists. According to a professor in the natural sciences, this is a more recent phenomenon: "In the last few years, there has been a huge shift towards 'You don't need any expertise. I should be able to do that as good as you.'" Expanding on this idea, this professor continued,

> "I think non-specialists want research to be understandable to them, yet, in some ways that's a weird standard to apply…Those of us who do it have studied it for many years. We've devoted a large portion of our lives to it. And to think that a non-specialist should just be able to understand what we do is kind of silly….I don't understand how cement dries. I have no idea how it does. I know there are engineers who know how that works. It's like, should I understand how that works? No. Should I understand why manipulating cement varieties can result in different properties and they want to use it differently for different buildings? I

> don't understand that, but I believe they have expertise ….I think that's a big hindrance that American culture has decided to hold expertise in some contempt."

Describing the mistrust and lack of respect from a perspective of personal gain, an associate professor put it this way,

> "I think a lot of people don't understand what scientists do day-to-day and what our job involves….I think we're living in a culture where a lot of people…would just dismiss that people have integrity in the kind of work that they do…Sort of idea that everyone's in it just to make a buck."

The idea of polarization was also used to describe the current relationship between the public and the research enterprise. An associate professor said,

> "Our society in general is just very polarized right now and many people have a negative view of science…somehow being biased to support a political agenda like climate change or evolution or those sorts of things. And so I think that… many people have the perception that scientists…we'll say anything, you know. We'll fake data to get grant money. So I think our society is sort of increasingly polarized and the perception of scientists and an organization like this will suffer from that."

Five interviewees, all from the public sciences and in varying research roles, emphasized public skepticism of science as being part of American culture in the current political climate but also gave examples of situations in which this occurred in the past. A research leader said,

> "I think from the beginning, my reading of history of America, there's been a skepticism against science and scholarship. What, forty percent of Americans think that the earth is flat or there are aliens. It kind of ebbs and flows and it depends on political waves. Right now, of course, we're in a fake-news moment, and so I think there's just a general skepticism about science and ideas and vaccines cause autism and all the stuff that happens… That it is just part of the American culture and …feeds the lack of legitimacy."

Related to sentiments about polarization, elitism and anti-intellectualism are sub-themes mentioned by approximately one-third of participants in the discussions about mistrust among the general public. An associate dean in the public sciences described the current anti-science sentiment as a general mistrust of academia, having less do with the reputation of specific institution.

> "I think there is such an erosion in respect for scientific data that it really – I don't know what to think anymore. I think the school per se and the university has a reasonable reputation but there's anti-intellectualism and the whole denial of scientific fact is a real serious problem and I think it's exemplified by the vaccine/anti-vaccine people. We are in a very, very difficult time."

Other interviewees attribute the mistrust to both academics and the institutions they represent. An associate professor said, "I think it's happening in our current political climate where there's a distrust of academic institutions, of media, of anyone who is kind of portrayed as this educated elites." A professor in the public sciences expressed a similar thought, emphasizing the term "liberal:"

> "I think [there is a] perception that universities are, by nature, liberal institutions – meaning that there's a far-left kind of view of things, and so that people automatically assume there's a bunch of these liberal college professors… And we're seeing that right now today in so many areas of public discussion and acceptance, climate change…vaccine hesitancy."

Mistrust is also described as a problem of the public not seeing the value of research and how it relates to them, making those who do the research appear out-of-step with reality and the needs of the larger population. To this point, an assistant professor noted,

> "I think, with the public, it's about not being able to actually communicate the value of what you're doing….We all see these critiques of taxpayer funding for really niche research and sometimes it is just regarded as kind of ridiculous and a waste of money. But I really believe in the value of knowledge, and of developing knowledge, and accumulating knowledge for the sake of knowledge and for the sake of our world. I think the big questions that we have to answer around health and society and climate change and all of these things require accumulation of knowledge…So I think when researchers or academic institutions are not able to very clearly and plainly explain the value of what they're doing and how it relates to average people's lives or everyday lives, I think then we lose some legitimacy and we are seen as this kind of ivory tower, and disconnected and out of step with the world."

Emphasizing the need for a more direct connection to tax-payer-funded research and the value it brings to society, a division head in the public sciences said,

> "I think some of our stakeholders like the legislature…and residents, maybe don't see the connection between what we do and how it impacts their lives. I think the town/gown divide might be pretty big where it's like, okay, we're ivory tower. We research the things that we do…as long as we get tenure…That's our main thing….Having our work resonate with the most pressing needs of the state isn't seen as an imperative."

Lack of Incentives

The research reward system in and of itself can be a barrier to legitimacy. The mutually supportive funding and peer review system can also prohibit investigators from spending the necessary time communicating, translating, and disseminating research results in a useful way to inform policy or practice, unless this is a specifically delineated requirement of the funding source. In the field of research, dissemination commonly refers to the publishing of findings in scholarly journals. Investigators must maintain productivity by publishing in journals in order to be funded for research. It is a supportive but also neglectful cycle where social responsibility aspects are not often prioritized.

According to about half of the interviewees, the lack of formal incentives in the research process to communicate and interact directly with the public is a barrier to organizational legitimacy. A professor in the natural sciences said, "We're rewarded for it a little bit, but we're not rewarded for it to the same degree as we are rewarded for

publishing papers." Describing the current incentive structure, an assistant professor in the natural sciences echoed this sentiment:

> "I think the barrier is just maybe there isn't the incentive for people to do that. You know, as a researcher running their lab, if they're bringing money in, they're publishing, they're on their tenure track or they've achieved tenure…I think people just aren't incentivized to do more than that, which is a shame."

The burden is on the research enterprise to begin changing this dynamic. A division head said,

> "As part of our land-grant mission, we should be an asset to address those questions and not only do we publish off of it, which we have to do, we want to see it implemented. We are part of the partnership that has the results of our work implemented into policy, into practice."

Misbehavior and Poor Standards of Practice

Misbehavior in research is another theme that emerged when talking about barriers to organizational legitimacy, particularly in maintaining public confidence. In contrast to the theme of ineffective communication, examples of misbehavior emphasize practices in research that are described as questionable, poor, or sloppy, but fall short of egregious misconduct like plagiarism or faking data. These practices are not necessarily unequivocally wrong but raise questions and uncertainty. They include, for example, concealing conflicts of interest, poor management and documentation of data, sharing only select findings, and so on.

Questionable practices can be detrimental to relationships with funders and other external entities that support research at the institution and can impact the reputation of more than just the investigator in question. Talking about how irresponsible behavior becomes a barrier to legitimacy, an assistant professor in the public sciences said "I think with funders, it's really 'Are you not delivering on what you said you were going to do?' I think that's the biggest barrier, short of really egregious missteps."

The importance of proper training and research design to avoid questionable research practices is critical to building trust with funders and other external regulatory bodies as well as peer reviewers. An assistant professor in the natural sciences said,

> "The lab needs to do a very good job at maintaining the record and also training good people. So if the personnel in the lab, they could not reproduce the data that they generated themselves, that means the training has a problem… or the way that the research was designed is a problem."

The appearance of bias or possible conflicts of interest in research can also lead to a loss of trust and confidence among the public. According to a professor in the public sciences, "Researchers sometimes are biased – not necessarily directly financially biased, but because of their understanding, because of how their research evolved, because of who their mentors were." This interviewee went on to talk about how presentation can become questionable when findings are overstated:

> "In the media…either making a big deal out of [a] maybe not very significant finding, or the way data is presented in papers…in a way harms…our standing as researchers because we need to be very unbiased, very open-minded and ready to

> accept whatever comes out of research. It could be good, it could be bad, it could depend on the situation."

Inadequate Mechanisms

Following the rules and standards of practice is not always straightforward. Sometimes the mechanisms that exist to ensure responsible research are created using a "once-size-fits-all" approach is ill-fitting, inappropriate, overly burdensome, or ambiguous and therefore implemented inconsistently, becoming a hindrance to responsible practices. A division head in the public sciences put it this way: "At times we're forced into accepting approaches for doing research we really fear will produce biased results, but there's nothing that we can do about it…So then where is the legitimacy of publishing biased research?"

The Institutional Review Board (IRB) was cited by three public science researchers as being, in some instances, a prohibitive mechanism rather than a safeguard for social science researchers. Explaining how the current IRB model does not always fit all types of research, a division head in the public sciences said,

> "I think the IRB is still framed by a biomedical model and so they don't really understand some of the work that we do…We might be survey researching. We are not like biopsying muscle mass from people's thighs…Yet the same level of risk is ascribed to some of these more sociological or social and behavioral types of investigations as they are to biomedical ingredients."

According to a few participants in the public sciences, in addition to mechanisms not being an appropriate fit, there is also inconsistency of implementation and oversight

with regard to these mechanisms, which creates barriers to legitimacy. Discussing variability in the IRB process, one public scientist said,

> "I think they still have to get their heads around the wide array of research that's undertaken with this university and this sort of work that we do within the [college]…Depending on who you get at the IRB, some people would say it's not exempt."

Indicating that inconsistent implementation of research oversight mechanisms is a problem spanning beyond one university, an associate dean in the public sciences said, "I wish there were some more consistency with the IRB's across the country."

Oversight systems and responses to problems in research are perceived to be inauthentic by external stakeholders, can damage the relationships of those who work with communities in doing research. An example provided by a public-sciences professor is a situation where the university was being externally mandated to create a community advisory board following a research-misconduct event. According to this participant, the institution directed very few resources to implement and manage this process in comparison to other research-compliance systems supported by the institution. This person said,

> "If that was our way of saying the university will do research with better integrity, yet…We have a huge staff that's part of human subjects and IRB review. We have folks that are paid really high dollars in the [University Office of Research]….but this board is getting nothing to do this oversight role. That was our way of kind of getting out of trouble. And to me that feels like it's lip service."

Somewhat in contrast, on the topic of external mandates, a dean in the natural sciences talked about the continually changing baseline of expectations that external regulators mandate in the research environment as an ongoing administrative barrier that impacts trust and confidence in the research. Institutions are continuously having to invest in their research infrastructure. This interviewee compared it to keeping your house "up to code":

> "You could have an older house that, when it was built, everything was up to code. If you go to replace something, all of a sudden you find out there's all these things that are no longer up to code because the codes have changed. And I think we see that to some extent at the university as well."

Describing how this idea translates to the research environment, this participant emphasized that the problem of more stringent or up-to-date requirements is not that they are not important or necessary; rather, when they are mandated without additional resources, they become barriers, changing the research environment in subtle and not so subtle ways. There is a financial cost to keeping things "up-to-code" that is not necessarily appreciated by those external to the process:

> "You know, there are probably good reasons for those requirements to have changed over time. Certainly some of them are there as we learn about the dangers of certain chemicals for example. So you may have to store them differently than you did 30-years-ago, and that's all good. So I think generally, yes, all of these things do help to increase organizational legitimacy, increase safety. What I think is not widely appreciated is…we hear a lot of complaints

> about…the ballooning administrative costs at universities. Well, frankly, my sense is a lot of this has to do with these added compliance requirements across the board. That requires people, it requires time, and effort, and therefore added costs."

Highlighting an instance where no appropriate mechanism existed at the institution to deal with a data-management issue, a professor in the natural sciences referenced a past case of unintentional misrepresentation of data caused by declining mental-acuity. Describing the circumstances, this interviewee said,

> "I had a situation where I was a PI of a major NIH contract. We had testing done here at one of our laboratories by someone who – it was incompetency, not intentional misrepresentation….and we lost over $1 million in blood samples because of… they mixed them up and didn't know what they were doing...We only found that out by accident."

Describing the challenge of a lack of mechanisms to manage this type of unintentional situation and comparing it to this situation other professions, this scientist said,

> "I think there's a…challenge within competency and with…mental acuity, as one ages… We surely talk about pilots, we talk about surgeons, …At what point does research being conducted by certain individuals become a challenge as it relates to mental acuity and basic stability?…So I think that we don't have a good system for that."

Continuing to describe how there is no real way to deal with this type of situation at an institutional level, this interviewee said,

> "We ended up having to scrap all this work, and the entire work was lost…There was no mechanism for dealing with unintentional and incompetency or loss of mental-acuity status sufficient that could have an impact on the research."

This professor went on to say that, while the University did a thorough investigation, it was not relevant: "The University did a good job, but they couldn't find intentional misuse, which we never alleged… And so of course there was no finding of fault, even though we lost $1 million on the samples."

Negative Story or Scandal

A public scandal or "bad story" about the university or about academia in general was cited by nearly all participants in response to the question of what hinders organizational legitimacy. Whether the story is about an allegation of research fraud, a student-conduct event, a controversial hiring or firing of an administrator, or other institutional matter, any highly publicized negative story related to the university has the potential to damage organizational legitimacy. Several participants talked about the detrimental consequences and erosion of trust that was experienced by the public and the research community as a result of research misconduct. An associate dean in the natural sciences said,

> "…I mean, look at this damage. Bad research is done….now we have measles all over the place and you know why it is…because someone published a wrong study long ago…And so people just aren't taking…their immunizations and now we're getting, we're getting problems."

Four interviewees all referenced the same misconduct event that occurred at their institution in the last decade as having some level of impact on their work and reputation. This event did not take place in the interviewee's own departments or disciplines. One research leader in the natural sciences summarized,

> "All you need is one bad story, right? You get one bad story. I mean the [University] had the issue – this was before my time – but wasn't it with the [department name], and they were not complying, and I don't know all the details, but I mean that was a big deal for the university….I don't know, to be honest, how isolated it was, but that created a lot of bad press and I think had ripple effects on the university as a whole for many years….The good stories never spread that fast."

Emphasizing the scope of a situation like this and its carry-over, another interviewee noted, "All you need is one or two bad ones and it undermines the whole enterprise, frankly." Echoing this sentiment and emphasizing the lack of differentiation among the public in regard to the pervasiveness of this type of conduct, an associate dean in the natural sciences said,

> "When we get one of these nasty examples of, you know, something going wrong where someone's made up data or… plagiarized or something that comes out in the news, and, because the public doesn't understand how much research is done that is… perfectly good, it can really erode the confidence. Because…they don't read the number of…scientific journals generally. They just don't have a feeling

> for what percentage…the things that get all the press are, compared to what's real."

Another researcher commented on the lack of differentiation on whether the scandal is research-related or not saying, "…I don't think your average citizen would separate necessarily trust in the research from trust in the organization generally." Continuing on in detail about how situations play out at the institutional level when there is a scandal, this participant said,

> "…I think that's the kind of thing that comes and goes in spurts when there's a bad press story. Athletics has a scandal and then there's criticism of the leadership…I mean presidents and chancellors drop like flies these days over allegations of one kind or another, and my impression without having the data in front of me is that there's a lot more turnover at the top because of that."

In short, negative events fuel mistrust, and universities respond to them publicly in order to gain back trust and confidence. These stories leave a lasting impact in the eyes of the public.

Most Salient Characteristics of Organizational Legitimacy

For the last portion of the interview focusing on the organizational legitimacy framework, participants were asked "*Overall, which characteristic or characteristics among these do you see as dominant or most salient with respect to your college or*

department?" This question refers to the elements of organizational legitimacy as listed in Figure 1: Conceptual Framework and include: public confidence, social responsibility, public trust, and meeting societal expectations. A total of 17 of the 20 interviewees provided a measurable response to this question. As Table 3 and 4 indicate, many respondents had a difficult time selecting one characteristic as dominant, either because they perceive them to be of equal salience or because they saw the elements as closely related.

The most frequently selected characteristic is public confidence in research (nine respondents), followed by social responsibility (four respondents), and public trust in organization (three respondents). One person responded that all four characteristics are equally salient. None of the respondents selected "meeting societal expectations" as the most salient characteristic. An associate dean in the public sciences said,

> "…I hardly even touched this meeting societal expectations. I would just say sometimes we don't necessarily because well, sometimes we're ahead of society. Sometimes we are dealing with very issues that are right in their face, the opioid issues, alcohol, mental health issues. So that probably is okay. I mean I think we're in the right place."

Table 3 shows that responses by college are mixed, with few clear patterns emerging. Of the nine who selected public confidence, five are from the public sciences and four from the natural sciences. Social responsibility had two participant selections

Table 3: Most Salient Characteristic of Organizational Legitimacy By College

	Public	Natural	Total
Public Confidence	5	4	9
Social Responsibility	2	2	4
Public Trust	0	3	3
Meeting Societal Expectations	0	0	0
All	1	0	1

Table 4: Most Salient Characteristic of Organizational Legitimacy by Role

	Collegiate Leader	Department Leader	Professor	Associate or Assistant Professor	Total
Public Confidence	2	2	3	2	9
Social Responsibility	0	1	2	1	4
Public Trust	1	1	0	1	3
All	0	0	1	0	1
Meeting Societal Expectations	0	0	0	0	0

from each college. Public trust was selected by three respondents, all from the natural sciences. Explaining their choices, more than one respondent used “public confidence” and “public trust” interchangeably, though public confidence usually refers directly to research and public trust refers to the organization.

As Table 4 indicates, responses are also mixed by research role, with few patterns emerging. The nine respondents who selected public confidence as the most dominant are at different role levels: three professors, two department leaders, two collegiate leaders, two assistant or associate professors, indicating that this characteristic has saliency across the varied levels of a research career. “Public trust in organization” was not selected as most dominant by any respondent at the professor level, and social responsibility was not selected by any respondent at the collegiate leadership level.

Public confidence in research, the most commonly selected characteristic, is described by more than one respondent as the characteristic that is most wide-ranging and all-encompassing of the other characteristics. A professor in the public sciences put it this way: “I think confidence in research…it's comprehensive. It kind of includes other things.” Speaking about it in a broad sense and how having confidence in one area can influence confidence in other areas with regard to institutional reputation and legitimacy, an associate dean in the natural sciences said, “They [the public] have to have confidence in our research and our scholarship and…in our fairness that…when we give a degree, it means something.” A professor in the natural sciences described the characteristic of social responsibility as the one that was all-encompassing of the others and the most salient saying, “I guess in some ways I see societal responsibility as encompassing the

other three...I think most of us value science and scientific process as something that rises above organizations."

Conversely, the individual who responded that there is not one dominant characteristic and that all are necessary described it in this way: "It's like a chain, you know, if any one link is weak, the whole chain is gone." Explaining this in greater detail, this professor in the public sciences said,

> "Research, no matter how good it is, no matter how solid it is, no matter how consequential the results might be, if it doesn't translate into effective policy in our communities, it's just a bunch of publications. At the same time, if policy is not informed by good research, or worse yet, informed by bad research…policy is dangerous. And so I think that each one of those…come together to that very nexus…you've got to have social responsibility. You have to have research integrity. You've got to have a way for the public to believe.

Public confidence in research and social responsibility are also discussed in terms of influence, funding, and the sense of ownership among the public. A professor in the natural sciences put it succinctly in terms of funding saying, "Public confidence in research is – trust is one thing, confidence is knowing that…your tax dollars are put to good use…" Similar thoughts related to the use of public funds were expressed concerning public trust in the organization. An associate dean in the natural sciences said,

> "…the public needs to trust that we're good stewards of their money. The public needs to trust that we're behaving ethically and that the results we are reporting

> are fair and honest, that we're not manufacturing data, things like that. You know, when you do have an ethical breach like that, it makes big time news."

Explaining further, this individual emphasized how trust is a necessity because of the public investment:

> "So everyone sort of has a vested interest in it. You'd go to parties in your neighborhood, or you walk up and down the street and people know where you work and they like to ask questions about what goes on at the University…Everybody has a little bit….of ownership into it….I think the public trust that's probably the one that comes into play locally, closely."

Emphasizing social responsibility and its relationship to public perception, a division head in the public sciences said,

> "…I think they do see us as a socially responsible. I think that's probably one of our strengths…that we're a white-hat school, …We don't accept a lot of Pharma money…We're not shills for the dark side…I think that they still think that …the work that we do...does have social capital or social traction."

Some interviewees emphasized public confidence as it relates to the scientific process. A division head in the public sciences noted, "I think public confidence in research…and the research process…is what's going to eventually influence how we can actually do meaningful research." An associate dean in the public sciences spoke about the lack of understanding of the scientific process and how it contributes to lack of confidence among the public:

> "Public confidence in research right now I think is just – is the one that really worries me enormously. … They may not understand a whole host of things, but if they basically trust research and science, they will believe that it's done right… I think there's a real deficit in understanding research, scientific research period."

In summary, regardless of the specific characteristic selected, responses emphasize public investment and public influence in research as being critical factors connected to organizational legitimacy.

Conclusions Related to Organizational Legitimacy

Public trust in research institutions, public confidence in research, social responsibility, and meeting societal expectations characterize the framework of organizational legitimacy. Participants who took part this study perceive these elements to be central and fundamental to the overall credibility, reputation and mission of a research university. Responsible stewardship of public funds and an obligation to serve and educate the public are central themes in the discussion of organizational legitimacy. Achieving legitimacy involves actions and practices that are perceived to be of high standards and performed by those with specialized expertise, rigorous training, and a positive track record in terms of funding and publishing.

External stakeholders who determine legitimacy can be broadly divided into two groups: those external to an organization but actively part of the academic research enterprise (e.g. funders, federal regulators, journal and peer reviewers), and the general public. The general public relies on the former stakeholder group to ensure that systems

and processes are in place to ensure responsible research, but the general consensus among most participants of this study is that the general public is unaware of the specific rules and regulations governing research. The existence of a checks-and-balance system promotes legitimacy with the general public, whereas specific standards of practice, reporting, track record, and adherence to compliance requirements are expected by the academic external stakeholder group. Misbehavior in the form of questionable practices, poor reporting or use of funds, or an egregious case of misconduct hinder organizational legitimacy in the eyes of both stakeholder groups.

Overall, the general public largely does not distinguish between institutional behavior and organizational events and this can have an impact on perceptions of legitimacy in research. Negative events are more often publicized, and perceptions of trust and confidence may be influenced by activities that are related or unrelated to the actions taken in the research environment. Communication via various media tends to oversimplify or miscommunicate research in a way that leads to misunderstanding or perpetuates mistrust.

Meaningful interactions where research and its potential usefulness can be explained and discussed with the public are perceived to promote organizational legitimacy. According to participants, these can come in the form of public talks, volunteer opportunities, and places where direct connections can occur between researchers and the community and dialogue can take place. Organizational legitimacy can be strengthened through more positive connections between the university and the

community, with researchers and the institution taking a more active role shaping, educating, and translating research to the lives of individuals.

Perspectives on Organizational Virtuousness

Next, I presented the organizational virtuousness framework to participants, showing them Figure 3 with the five elements: collegiality, trust, openness, integrity, and purpose. I explained that this framework represents the internal positive characteristics of an organization, with particular reference to the research environment. Organizations that are "virtuous" strive to maintain these characteristics in the work environment in order to perform and produce at optimal levels. To assess respondents' understanding and initial reactions to the framework, I asked participants, *What role would you say these elements play in your college or department?* A majority of participants initially reacted using words like: critical, necessary, important, foundational, and aspirational.

One public research leader characterized the five virtues as pillars of the institution, emphasizing that their existence relies on leaders at all levels of the organization:

> "These are, in my opinion, foundations and key pillars of our craft of who we are as an institution. They collectively are aspirational. We aspire for integrity and openness and trust and collegiality. In any human organization that comes and goes and at any given spot in an organization, it's better or worse. These things are advanced or not advanced by the messages of the school, university, college leadership. To me, these are the fundamental messages of the leaders of our group. And if not understood, promoted and incentivized, we lose them."

Talking about the importance of all five virtues at varying levels of the organization, from the laboratory and departmental vantage point where the research is conducted or supported, a departmental research leader said:

> "So departments are collections of individual research laboratories. So what goes on at the departmental level is to a certain extent recapitulated at the individual laboratory level. So at the department level, we deal with the administrative functions of the department. We deal with the relationships to the individual faculty in the department. We deal with the relationships in the department to deans and administrative units of the university. And so there are a number of different connectivity's or constituencies…and in order to develop and maintain a good working long-term working, relationship with all of those groups, each of those five themes, each of those five virtues, has to be present at all times."

A professor in the natural sciences was struck by how well fit the framework characteristics describe a desirable research environment stating, "Just my own personal view is that they are all extremely important…Virtuousness is a great word." The virtues' being aspirational nature was a common theme. Providing an example of how the department works toward these virtues, an assistant professor in public sciences said,

> "I think they're huge…I don't think they are always present, but I think…there's an effort to strive for them to be present. And we're actually, in my department, in the middle of a strategic-planning process among the faculty. And so we've been talking about some of these same things and talking about what values we hold and collectively and individually. So this feels really timely."

Other interviewees focused on the characteristic of integrity as being the most important element of the five but indicated that all of the virtues are important and highly valued. Conveying this thought, a division head in the public sciences said, "I think that they exist, but not at optimal levels. I think integrity, I think that that's the one, that's a strength of the work that we do here." A professor in the public sciences also emphasized integrity as the central element, further describing how it was related to achieving the others:

> "I think that that the sense of integrity has to be first and foremost…I mean that… people have a standard of…quality and research integrity that that is the norm... That should be the norm. You go in with that. I think whether you get along with somebody or not is really not important. If, in fact, you are assured that the integrity is really there, I guess that kind of comes with a sense of trust…I don't think purpose necessarily weighs in as much because what is the purpose of one person's research can be a very different priority or purpose for somebody else."

Drawing a connection between the five virtues and credibility, an associate dean in the natural sciences said, "I think these are important values…we want things to be open and understood…If we move to thinking about research, integrity and your credibility are the whole thing on which everything is built." This same interviewee went on to talk loss of credibility when there is a perceived lack of integrity: "I mean for me this is… the most important thing—your personal integrity. There's no department, there's no government, there's no institution here that can give me back my credibility or my integrity when it's perceived to have been lost."

Getting along and working together is a theme that emerged in the responses of a few participants when talking about the role of the different virtues in the research environment. Some called this collegiality, while others did not use this word specifically or indicated that it is more than just collegiality. An assistant professor in the natural sciences emphasized collegiality as a central element, or as he put it "being friendly to one another," and connected this idea to happiness in the research environment: "People would like to stay in a place where you're happy. They cannot do good research if they are not happy. If the environment is hostile, they will probably feel depressed." A division head in the public sciences commented on how all of the virtues are present despite the high-pressured work environment:

> "I think they're all important. We have an interesting division, and I've always thought this since…coming here 25 years ago…It's a very, very high-pressured environment, a very productive environment. We depend on grants for our support, and that's how our faculty get graded, you know, from your view, in addition to teaching. But research is very, very important. So I've actually always been amazed that somehow within that culture, people are not competing with each other."

Of the 20 participants, one interviewee, a research leader in the public sciences, initially responded the five virtues did not resonate when she thought about the characteristics of the research environment. This participant said, "I mean, they don't all make sense to me…I'm not sure that's the list I would have put together." Thinking some more, this person continued:

> "I'm not sure that collegiality…I mean, I think some of it, maybe? Is it an organizational virtue? But not necessarily. When I think about research integrity, it's like 'how we get along with each other… how we talk to each other and do conflict resolution if there's a disagreement or something else.' But I guess, to me, when I think about the virtues around research…to me it's just not quite as clear of a list…I'm not resonating with your list."

While this participant did not initially connect with the framework, as the interview progressed, each virtue was discussed independently and the interviewee was able to talk more at length and provide responses to the more specific questions about the framework.

Promoting Organizational Virtuousness

Next, I asked interviewees more pointedly, *"What kinds of things foster or promote the characteristics of organizational virtuousness [collegiality, trust, openness, integrity, purpose] in the department or college?"* Responses are grouped into the following categories: norms of conduct in the work environment, research collaborations, gathering and recognition, and transparent decision-making and leadership.

Norms of Conduct

Interviewees described formal and informal norms of conduct, or collectively understood ways of working both individually and together that promote the virtuous characteristics. In discussing norms of conduct as a way to promote organizational virtuousness, participants from the natural sciences more frequently cited formal examples like implementing a code of conduct, creating an individual development plan,

reviewing and signing an advisor-advisee statement, or formal mentoring programs as ways to facilitate common ways of working in the research environment. In most cases, formal examples were given by those who are in the role of professor or administrative research leader. Participants from the public sciences more frequently emphasized informal or "unspoken" norms that evolve through conversation or on an *ad hoc* basis as well as examples of the violation of norms.

On the formal side, two interviewees, both in the natural sciences, cited written contracts as an effective tool. One interviewee, an associate dean in the natural sciences, emphasized the importance of instituting a code of conduct between students and faculty researchers to underscore values and acceptable behavior as well as clarify expectations between parties. This research leader said,

> "We are really valuing…the workspace and…we've really revamped awareness of all these issues…Just this morning we had a meeting, and we talked about code of conduct and how we're reading the code of conduct and making mentors and students aware of options, and having almost like a contract or an agreement at the beginning….Some of it is imposed from outside, but I think it's more because we recognize this is important. These are our students, this is our community. "

This interviewee also talked about using the code of conduct as a tool to facilitate conversations and create awareness of rules and expectations:

> "Let's say for our graduate students, when a graduate student joins a laboratory and picks a mentor, they're going to read that thing. They're going to sit down and they're going to read the thing and they're going to sign-off on it and discuss it.

> And, there'll be someone who will keep track of it. These things, the code of conduct for the college, will be posted on some links…Just so people are aware…what's expected."

Consistency in expectations between advisor and advisee plays a critical role in the research environment. According to one participant, until recently, there were few formal materials to provide guidance on what makes a good mentor. The recent introduction of an advisor-advisee statement attempts to introduce consistency and formalize norms of conduct. This research leader explained,

> "We have introduced basically an example version of this. We're not going to force it on advisors. It sort of lays out the expectations of…what the advisor expects from a student or a postdoc and what they can expect from you. And what we found in the past is a lot of unhappiness, certainly on the part of graduate students…postdocs…is that there was not enough communication between them when they started and they didn't understand both sides…and what their expectations were for both."

Taking the idea of an advisor-advisee statement further, mentoring (faculty-to-student, and faculty-to junior-faculty) was cited by more than half of participants as a way to promote desired values in the research environment when done effectively and consistently. Talking about new initiatives at the university to produce materials on mentorship as well as a mentoring workshop for new assistant professor hires, a research leader in the natural sciences said,

> "We really care about our students and postdocs…but we don't really…I mean I've never gone through any formal mentor training. The University puts on various workshops so you can sign up to do them. And we certainly advertise those and encourage faculty to do that if they want to brush up."

Another formal document cited as a way to assist in goal-setting for researchers is an individual development plan (IDP). Described as a living document, an IDP also serves as a communication tool for researchers and mentors or collaborators and provides support for formulating appropriate goals and reaching desired milestones. A research participant in the natural sciences described the IDP in the following way:

> "…basically a living document that gets updated at least once a year…of your accomplishments, your goals…with your mentor… joint goals for what's going on. Things like professional development you might've done, what publications, if you did any teaching…so you can lay out…your achievements that year. And I think most people are always amazed when they actually get down to writing it down that they've done quite a lot."

Other interviewees gave more informal examples of organizational virtuousness within the scope of the theme of work norms. Ongoing, open dialogue about processes and values was a common response, along with strong leadership and oversight of the research process among principal investigators in order to ensure integrity. One professor in the natural sciences simply stated, "Integrity is something that you teach in your lab and kind of practice with your…collaborators." Another professor in the public sciences said,

> "I think, yes, as professors, I think it's important that we are closely involved with data. I am maybe a little bit of a control freak because I need to look at everything and sometimes members of my group…I just look at this huge table with thousands of numbers and immediately see and say, 'This doesn't look right.' So I notice them. They always are shocked…'How did you notice?' And that is because I come from a very long personal experience of working in the lab. I know what to expect, what to notice, and sometimes I can even see where it came from, the mistake, and they will go and check and come back…'Yes indeed. Oh my gosh.' …I think that is our role as a PI – is not just rely on…final results, the final summary that your group member brings to you, but actually making sure that it's accurate."

Discussing how research norms are communicated on an ongoing basis, a division head in the public sciences said,

> "We tried to have conversations about changes in how research is done – how…for example, data are managed,…security issues with data, training the students to properly handle data."

Research norms become apparent when they are violated. One interviewee talked about an unspoken norm within the department that was widely understood by researchers but became centrally recognized only once it was violated by someone outside of the department. Describing this incident, an associate dean in the public sciences said,

> "I got a call a couple of years ago from another school where one of our brand-new faculty had come in and said 'Hi…can we work together?' And they shared their data, and then the person published their data without including them. And I was like, 'We don't do that here.' …That was just such a… violation. And so we had a conversation, and the person is like, 'I don't understand why that's a problem. It's data. The data belongs to the University. I belong to the University. Any data the University has, I should be able to use without question.' …It is a virtue of …we have to trust each other and we will generally find that people who get a reputation, almost an individual reputation for being untrustworthy, like their careers are shutdown."

Another research leader in the public sciences described the violation of norms as "shocking", and went on to say also how working in teams and the peer-review process forces people to talk openly about their methods:

> "We do almost nothing on our own. So methods are there. They're scrutinized. We always work in groups. I don't think I've seen a publication with one name or two names in years. So you're having peer review within a division or within a school to look at something before it's sent out."

Reiterating the importance of ongoing dialogue about ways of working in the research environment, an institutional research leader who is also a professor in the public sciences, emphasized the importance of the manner in which expectations are discussed:

> "I think for me, I, as a leader now, seek to help have better alignment between what we say we want, these desirable virtues, and how we speak about these things. The symbolic nature of our leadership as well as how we think about people coming up for promotion and tenure or people in the wonderful P and A [professional and administrative] staff around campus…And even the students, how we say these [virtues] are the things that matter. And therefore if you see a problem of integrity, here's a way to help solve it. Sometimes it might be having just honest conversation with a colleague or a student. Sometimes you might have to elevate it…for a real investigation, and having the wisdom to know where and when."

Methods to alleviate bias and create transparency are important to the training of future researchers and in fostering a virtuous climate. Two research leaders in the public sciences described methods they use to this end: "I teach my students and I've had this philosophy for years…Aim for the null because you're most likely going to be satisfied if you aim for no data and it will keep you honest." A similar, more specific story was told by another research leader about working with a colleague and a doctoral student to review results from a dataset:

> "I said, 'Don't tell me which way the treatment variable was coded.' So, got it, or got placebo. Just have a one or a zero and I don't know which is which. And I gave it to the doctoral student and she did this amazing analysis and said, 'Here's the result.' And then I said, 'What are the assumptions behind the result?' …Then I eventually asked the original person, 'Which way was this coded?' …And they

> said a way that was exactly the opposite of what I assumed was coded, which to me was a wonderful thing because now the results were exactly the opposite of how she [the student] thought it worked.

Research Collaborations

More than half of the participants talked about some aspect of collaborative research as being a way to promote aspects of a virtuous environment if done intentionally and successfully. Some interviewees in the natural sciences talked about how scientific research has become increasingly multidisciplinary with collaboration being an essential component. Highlighting this sea change, a dean in the basic sciences said,

> "I mean, today it's no longer…the individual investigators sitting in front of their microscope by themselves. Science…is a team sport and it really requires, I mean, making the major breakthroughs, requires having those collaborations, which to me means being collegial…not only with people that are very close to what you do, but more broadly, in different fields. I mean, that's… where things are going and that's where the really exciting work is happening."

The funding and peer-review systems play a significant role in support of the transformation to more interdisciplinary and collaborative models of research. A professor in the natural sciences said, "A lot of science was collaborative in ways that it wasn't 20 years ago….And with a shift towards greater collaboration, I think there's a shift towards appreciation of greater collegiality." Another professor in the natural sciences described the shift in terms of impact by saying,

> "When you read about research projects 100 or 150 years ago, it's always this one person who was investigating something. …I think that everybody today realizes that people from different disciplines can have a much higher impact. And so it's become really kind of second nature to reach out and look for collaborators. And then that's something that is actively encouraged by the colleges."

Other interviewees expressed similar thoughts about the infusion of collaboration into expectations and the experiences of shared projects fostering trust, collegiality, and openness and, also improving the rigor of research. One professor and former department head in the natural sciences said,

> "If you're part of a school that…values collaborations, then it's easier to…make that part of your mission and it trickles down to students at your location. They are kind of brought up and mentored in the spirit of collaborating. So it becomes part of the culture."

Elaborating, this participant continued,

> "Having a collaborative network is a very effective network because, all of a sudden, you are focusing on one question and you're doing an experiment and then they have a collaborator who is focusing on the same question, but doing a very different experiment, and now you have another collaborator. So now you're having three, what we call an orthogonal approach to the same question. …So that is something that really helps with rigor. And…I think rigor is basically translating into trust by your colleagues."

At least three participants in the public sciences highlighted the features of mutual gain and reciprocity as benefits of collaborating. A division head in the public sciences emphasized the importance of team members bringing different levels of experience and expertise to the group. This interviewee said,

> "I think the nature of our work requires teams. Because…it's multidisciplinary and we have big studies, so in most cases, you really can't do the work by yourself. So I think that really drives a lot of it. …Things that help are kind of like, within my own team or some of the other teams, we have different levels of people and so, from my perspective as a research leader, I'm more senior so I bring experience, but the more junior people bring really a lot of excitement and ideas and they're much stronger than I am methodologically."

Talking about reciprocity and benefits to team members when they work collaboratively, an associate dean in the public sciences said,

> "When you get a well-functioning team, it isn't that 'It's my data because I am the PI and you can work for me and you can be third author. Don't you feel blessed?' It's 'Okay, here are the three papers I want to write. What are the papers you want to write? Cause I brought you in because you've got a different background than I do.' So together we are stronger…We don't replicate each other. We shore each other up."

A division head in the public sciences put it more succinctly in terms removing barriers and creating opportunities for mutual benefit by saying "To be a good citizen of the division of the school…part of that, it's about collegiality to try to remove those

barriers to collegiality and trust…So I will review your grant one day and you can review ours another day…that sort of reciprocity." A professor in the public sciences expressed a similar sentiment around mutual benefit saying,

> "But people do benefit from sharing…their expertise with other members of the team, because they know that other member will use this skill that they learn from you for their own project and they're not stepping on your toes. You have your own publication….It's your study. There is no… overlap, or if there is an overlap, it still doesn't take away from the leadership that person feels that they have in this study. But if you share your expertise, you help another person succeed, then they will help you when you have to do something where they have a little bit more experience. So this is very – it just works. It just works. If you're mindful of that, it creates a happier and more efficient environment."

An associate dean in the public sciences talked about the benefits of addressing research from a topical perspective and having a team with different interests on the same larger topic but coming at it with different questions, leading to a broader impact. This research leader explained,

> "We have, in different divisions…looking at a problem with a different lens. You might have somebody working on the biological effects of tobacco, for example, but somebody else is working on addictive properties, somebody else's working on interventions that help people quit smoking. …There's a lot of effort to try and communicate what people are doing in different divisions around topics."

Working as a team where members each bring different expertise and skills is clearly a benefit to the research and virtuous characteristics must exist for the team-centered model to work. Teams in which expertise and benefits are shared must operate with trust, integrity, openness, collegiality, and a shared purpose. An associate dean in the public sciences likened working in collaborative research groups to creating a musical piece. This leader said,

> "It's like the idea that you get a team together, and the team, if you think about it as a suite in music terms, it's multiple pieces that are each free standing, but together they make something bigger and more beautiful than they each are independently."

Research leaders from the natural sciences in particular discussed how working collaboratively is the new norm for junior faculty and that much of the culture shift can be attributed to assistant professors. Reputation as a collaborator is a consideration in hiring as well as an element of recruitment and retention of good faculty. One department head in the natural sciences said, "So the newer people…they're really good and…they're almost a different species. They have Twitter and Spotify…They've assembled their own mentoring culture, their own support groups and networks." Also emphasizing collaborations as a culture shift led by newer faculty, another professor in the natural sciences said,

> "So I think the culture has changed a little bit. People who come in and clearly just want to hole away, it's like, well, I'll never collaborate with that person. And

before…like, 20 years ago, that was not a premium in hiring, and now, it is a discussion in hiring…"

Two junior faculty members, both in the natural sciences, described the ways in which they were integrated into the culture of the department through formal faculty mentoring support structures. One said, "There is a requirement for a formal mentor. And so that's someone I'm still feeling out. You want to pick one or more people that you'll meet with annually." The other new faculty member who is in a different department in the natural science college said mentoring he was provided as a new faculty member emphasizes collaboration:

"They assigned senior professors to be mentors for the junior faculty. So we have an official mentoring committee from the department. That's three full professors for every junior faculty. …For more specific things like grant-writing and paper-writing and other idea discussion, we have a biweekly mentoring committee, which is composed of the department chair with two other senior faculty…So I basically have two mentoring committees.

Administrative support structures at the university were also cited by participants from both disciplines as a necessary element to facilitate positive research collaborations. Sponsored programs and research compliance offices at the university offer grant support as well as training and resources on data management, research conduct, funding management, and so on. An assistant professor in the public sciences commented,

"I think also having an infrastructure that supports…A lot of our work in this department is around writing grants, but a lot of that is done very individually, so

> if there's some infrastructure to better support anyone who has an idea that can pull together anyone else who might be interested in working together… And there's an administrative infrastructure to take care of the financial pieces and the other pieces that need to go into the grant, I think that would help."

Another research leader in the natural sciences also made a similar comment, adding shared equipment to the list of infrastructure needs:

> "I think to make research today function also we provide…logistical, financial, practical support, to many cross-college initiatives. Infrastructure we have…a lot of core facilities that we contribute to, which makes sense because…it wouldn't make sense for every single faculty member to have their own…pick your biggest, fanciest piece of equipment."

Gathering and Recognition

Various mechanisms in the departments and colleges, and in some cases, at an institutional level, bring people together physically, face-to-face in the research setting, as a way to promote the elements of organizational virtuousness. Faculty research groups or pods, departmental or collegiate seminars or weekly talks, and lab space or offices were named as ways to incentivize collaboration and, in turn, promote collegiality, trust and openness. One department head in the natural sciences said, "I mean all departments have to have collegial functions…we try to be supportive through mentoring groups, through small group activities, through social functions." This research leader went into more detail, saying,

> "We have a unique peer, small-group mechanism here where senior faculty, including myself, meet with groups of assistant professors to talk about their research and their career development. And we agreed to meet together for an hour, hour and a half, every other week. And so I develop a level of trust and openness with everybody who comes through and we help them."

Several interviewees from both disciplines emphasized the importance of proximity and physical interaction when conducting research was something. A department head in the natural sciences said, "Some people like to collaborate only with people who are nearby so they can see them frequently." A professor in the public sciences talked about the way the research space is designed as important in promoting trust and collaboration, saying,

> "I mean, even this building, the way it was built… Laboratory space was built in a way that there are no walls. …It's like you can actually get lost because it looks all the same, with just benches. So we are assigned bench number… it's just inches [distance from one another]. It was created in a way to promote collaborations."

Another division head in the public research college similarly noted that creating consistent and ongoing interaction among researchers through informal or formal gatherings is a critical part of developing an environment of collegiality and collaboration. This interviewee said,

> "We have an hour set aside every week that people can come together, share ideas, have a brown bag lunch, get together. We're also trying to get back to

> having a less formal monthly lunch together. Just so we see each other. Of course we see each other in regular meetings and that sort of thing. But we also encourage interaction between faculty to help each other out…review grants, support, co-mentoring, mentoring…across ranks."

An assistant professor in the natural sciences talked about sessions as part of a seminar series that brings faculty, postdocs, and graduate students together to hear about each other's work and foster connections. She said,

> "Part of our seminar series…we have these lightening talk sessions. It's usually once a semester. It had been five minutes, like lightening talks from Grad students, postdocs or faculty, but this year we're changing it so that faculty will give, like, a 20-minute spiel on their research to address just that. Because most of the time you have no idea what everyone else is doing."

Gathering socially is another way to develop relationships and collegiality in the department and college. Participants in the natural sciences most often suggested social events. One assistant professor said, "There's social events pretty frequently… There's two other individuals who started at the same time as me, so we'll go out…for a beer after work or something." This interviewee went on to talk about more formal social ways colleagues come together to talk about their work and share ideas, saying,

> "We have a lot of seminar speakers that come, and so there are opportunities to go out, to take them out to dinner. And that's nice because you get to know your colleagues here a little better in that dinner. But then you get to meet people from other institutions, …and that's a nice way of exchanging ideas too."

Talking about how collegiality is a part of the climate of the department, a professor in the basic sciences provided this example of a valuable interaction,

> "We have, once a week, coffee and donuts on Thursday mornings. So it just happened this morning. …People can drop in for five minutes or stay for however long, but it often…There's just people hanging around and talking for 45 minutes or an hour and, it could be research things, could be sort of more sideline things, but, it's really valuable."

Personal connections build trust on many levels. A former department head in the natural sciences expressed this thought about planning social events to get to know one another:

> "Yeah, we try to have social interactions, which we try to build in events that help people interact with each other on a human scale and a professional scale. You know, it's one thing for us to understand what each other's research does, but you know, to know each other in some ways kind of helps….Research can kind of beat you up. And to have some human sides I think is important."

Compatibility, shared interests and purpose in research are widely discussed as an important element that brought people together. This idea was more frequently discussed among participants in the applied sciences. Interviewees noted that they feel they were working with like-minded people who are passionate about similar things and this compatibility brings them together. Reiterating an earlier theme, researchers in the public-science division often come together on broad topics and discuss the focus and expertise they bring to an area of research. An associate dean in this division explained,

> "People self-identify, yes, they're interested in aging or cancer or something else. And then those groups can meet at least in one division and talk about common areas of interest. That kind of speaks to purpose too because it might be an interest in trying to reduce the harm from tobacco, or promote cancer screening, get the word out. And so people might focus on that work with health as a shared purpose."

People with similar research interests often come together naturally, but it appears more could be done to promote connections beyond the familiar groupings across the college and with other disciplines. An assistant professor said,

> "So we have a bunch of health economists and they tend to do some stuff together and I tend to do some stuff with people who work in rural or work in aging. And so there are some natural connections but not as many connections across the whole team. I think there's plenty of trust. I think people trust that everyone is doing their work with integrity and does high quality work, but I think there are not a lot of systems in place to foster organic connections and collaborations."

Departmental retreats are another way to meet and communicate around purpose as well as foster social interactions and connections beyond common, day-to-day work interests. In some cases, retreats force individuals to get away for the work environment and offer a way for faculty members to get to know one another on a more personal level. In some cases, family members are also welcome to attend, and, according to one participant, it is a retreat run almost like a "mini-conference" where faculty members give talks about their latest projects:

> "There are talks on some of the latest, most interesting stuff and we actually try and get the young scientists to give those talks, not the professors. …Then there's poster sessions. So we can go around and look at what everyone's up to and their research and talk to the scientists."

On the more personal and social side, she went on to say,

> "And then we have, sort of bonding time. There's time to go out and canoe or take bikes to the headwaters, …go hiking or whatever people want to do. So it's nice. It's sort of the check-in to get to know what people are doing."

Recognition through awards, announcements, or appreciation-type events was mentioned by approximately a third of interviewees, with more frequency in the natural sciences, as a way to promote collegiality and purpose. Recognizing outstanding scholarship among graduate students, postdocs, and faculty can serve as a way promote specific values within the organization and work environment. One department head in the natural sciences said, "We're fortunate enough to have endowments that provide us with some operational funds that allow us to recognize faculty and students and trainees. And so the honors and awards banquet is more than simply a pat on the back."[349] This leader went on to say, "We recognize people for outstanding research scholarship through big things like announcements and broadcasts on web sites and so forth. We recognize little things like births of children, birthdays, and personal connections."

Another research leader in the natural sciences talked about one of the few times they gather all the departments in the college annually for a special awards ceremony where undergraduates put forward faculty in various categories. This interviewee

described it as the “Oscars” of the college. Talking about recognition, this person said, “Our dean will send out emails when someone's been elected to the academy or had a really big paper…or there's some new patent or something.”

Sharing successes is an important component in working toward organizational virtuousness. Another way to promote collegiality cited by a dean in the natural sciences is nominating fellow colleagues for awards. This dean said,

> “I think another aspect of collegiality is, if we want to raise the visibility of our research, part of that is nominating our faculty for prestigious awards…That's not going to happen unless you have a collegial culture in the college, and in the departments, because you've got to nominate each other and say nice things about your colleagues.”

Transparent Decision-Making

Transparent decision-making by administrative research leaders is another common theme that emerged when participants were asked about the actions that promote the characteristics of organizational virtuousness in the research environment. Transparent decision-making includes: equitable distribution of resources, fair and open policies around budgeting, clear metrics and expectations related to faculty work and research productivity, and input in departmental planning and priority-setting.

One professor spoke about the institution as one of the most collegial places in the nation because of the transparency of decision-making, particularly with respect to budgeting. This participant noted that, among peers at other institutions, by comparison,

discussions around vision and investments were not as open. Elaborating, this participant said,

> "A lot of it is that I think there is more transparency here in how a college is led, for instance, and…where the money goes, where the money comes from, what the priorities are. And even though you might not always 100 percent agree with what is done at the Dean's level, there is a lot of transparency, and I've heard you always have the option to chime in if you have a different opinion."

This respondent continued by saying the same process translates down to the departmental levels.

Two interviewees in the natural sciences spoke about the leadership of their dean and the espoused values of transparency and fairness. An associate dean talked about how, prior to this leader, there was a perception of unequal resource distribution and it was important for the new dean to overcome some of these negative perceptions. Describing the long-term impact of this, this participant said,

> "So the Dean is very much aware of, in the past, there was some special deals. And someone would get something in the offer letter that someone else wouldn't get. And it causes problems because it's not fair. It's not equitable….And since it's in the research space, it undermines…collegiality."

Equitable teaching assignments are also important to promoting transparency. One department head talked about his strategy to maintain a perception of fairness by saying "I personally try to teach a little bit more than everybody else does because no one ever comes to the department head telling them that they're too busy to teach if I am

doing more than they do." Having an open door and making people feel as though they are welcome to come and talk to leaders about decisions, ask questions, or give input is also important. A division leader said,

> "Well, as a person in leadership, you have to set an example. And so, I basically say that anybody can come and talk to me about anything whenever. It's whenever I'm available. So I don't make big barriers about certain times and appointments and everything. People should feel free to drop in… I always try to be very transparent about what the situations are in the division. Why and how decisions are made. And I think that translates across the faculty."

Transparency in decision-making on its own is not enough. Seeking input in decision-making is another critical element. One professor emphasized the potential for frustration among faculty if they perceive that their input is not sought in the process. Highlighting an example, this professor said,

> "She [The dean] comes up with these really great ideas, we're going to do this or what stands out. And then she just tends to…we need to implement this now. And the faculty don't – suddenly there's some change that they've had no input in or anything…you know, she's [the dean has] cut some programs that were very popular to save money and various other things I've introduced."

This individual continued,

> "She [The dean] wants basically the entire budget ultimately to be completely transparent and that there's a formula that is used to kind of calculate all the pots of money and that everyone understands what the college is funding, where that

money's coming from, and how it's allocated in a fair way. And those are really good goals. It's just sometimes she does it a bit brutally."

From the dean's perspective, relying on committees and other leaders at the departmental and unit level to serve as sounding boards as well as liaisons to the faculty is critical to gathering input and gaining support for decisions. A dean said,

"We have some standing committees that are involved in decision-making. So just this morning we had our [committee], which is all the department heads, all the associate deans plus various other unit heads. They are key. I mean we don't vote on things *per se*, but certainly it's a really important sounding board to keep things open."

Being a part of crafting a vision and priorities through a strategic-planning process for the unit is important to creating openness, trust, and purpose and bringing people together for shared goals. One assistant professor in the public sciences talked about how things that may seem small to those outside the division, like an emphasis on a certain area of research, have potential for great impact in the research environment:

"It ends up mattering a lot and how we write up our mission statements and how we position ourselves and how we see our work connecting with one another. And that difference has really come to light through the strategic-planning process, which has been good. And we're working right now on writing a mission and vision statement."

Emphasizing the ways in which a planning process highlights the collective purpose of the work, a division head in the applied sciences described the current strategic-planning process:

> "We've had multiple meetings that are kind of enlightening. Who are we? Where do we want to go? … Because I think oftentimes we don't know why we're doing our work…So it just reminds us about why it is we're doing our work…It gets at that purpose and it's a collective thing. It's this long process. It's iterative. So hopefully we cultivate that sense that it's not just about you. We have meaning in our work.

Whereas strategic-planning processes are often cited by leaders as a positive way to prioritize in a collective and inclusive way, other interviewees expressed frustration about the inaction, once the planning process has concluded. One professor lamented a strategic plan that involved a lot of time and energy but no systematized way to move initiatives of priority forward. This interviewee said, "Where it fell down was I don't feel the Dean's Office has really taken those reports and really tried to tell us, …'Have you implemented any of the recommendations?'"

Transparency in decision-making also requires leaders to provide clear metrics for measuring the success of faculty, the department, and the college. One professor said of the dean,

> "I think she [The dean] expressed…advancing the field, scientific knowledge, publications…So getting your data from the bench out there, getting it out in the public, that, to her, and, at the college in our department level, that's been

> weighed more highly than the money coming in. There's a lot of reasons why you can't get a grant, but if you're publishing your data, which is peer reviewed, clearly, it's a value. So that seems to be more heavily weighed. And then of course the teaching is always an important element because that's the next generation. So that's a big focus here."

Openness in the tenure process is another way to convey how success is measured in the unit. On allowing the assistant professors to be in the room to hear feedback from colleagues, a participant said this practice was "very reassuring, extremely collegial, and very supportive." The interviewee described the process in this way,

> "…So it used to be when the assistant professors were being reviewed, all the assistants were out of the room. But now they decided that it would be a value to the assistant professors to be present. So that one individual leaves the room, the assistant professors didn't have access to…the packages, but they were in the room during the discussion."

A key point for this researcher in her interaction with departmental and collegiate leadership through this process was, "You can still have a really successful research program and not bring in millions of dollars…There's many different ways of doing science."

With respect to the tenure and promotion process in the public science college, an associate dean expressed a similar idea of trying to get away from "bean counting" and how many papers were written, and focusing more on the unique ways a faculty member contributes to the department and research teams. Describing other measures, this

research leader said, “Can you actually be a member of a team without being in front? Can you help your students get publications? It's way harder to help a student get a publication that needs one than to get your own.”

Barriers to Organizational Virtuousness

The next question posed to interviewees about the organizational virtuousness framework was, “*What are things that hinder or create barriers to organizational virtuousness in the research environment*.” This question is intended to elicit examples of activities that participants perceive to impede or hamper any or all of the virtues in the research environment. Common themes that emerged from interview responses included: difficult people, disconnected or dispersed climate, lack of transparent decision-making, and pressures and expectations.

Difficult People

Nearly all participants talked about the negative effects that difficult people or even just one difficult individual can have on the climate of a research environment. Difficult people are generally defined using words like: non-collegial, ego-driven, untrustworthy, entitled, hostile, and resistant to change. One scientist provided this description:

> “Science is a very kind of ego-driven business and I think what is most damaging for a scientific community is probably if somebody neglects some of those

> integrity rules and just marches forward, and is in a powerful position and pursues his or her own agenda."

A small minority of difficult people, in some cases even just one person, can have a lasting impact on the climate of the research environment. A research leader in the public sciences said, "It just takes one or two people that kind of maybe shift some things." This division head elaborated,

> "We were fortunate that the two individuals who had very non-collegial mentalities… they left. And I think they left when they realized that people just finally got sick of them and they were being…pretty much isolated from the rest of the division because…there was complete lack of trust with them. Nobody in the faculty wanted to work with them. Those that had to work with them, did it with gritted teeth. And so once they were gone, it was a much happier place to be."

On one hand, difficult people can hinder trust by frustrating those around them and wasting time and energy in an already busy and pressure-filled environment. On the other hand, a research leader made the point that difficult people can also have the effect of creating a stronger bond among the larger group. This leader said,

> "…I think there's a sort of a social-cohesion component here that is so essential, such that if someone's violating the rules, the group itself is the one who says…we're going to fix that problem. We're going to expel you. We're going to remove your bad work."

While several participants described one or two experiences with difficult people, most also noted that the situations are sometimes resolved by avoidance. One professor put it plainly, “Over time you learn who you really respect as a scientist and who you want to collaborate with. And then you also learn who you don't respect and who you don't want to collaborate with.”

Disconnected Climate

In some cases, the examples provided went beyond detailing problems caused by a few difficult people to more entrenched elements that tend to exist in large, decentralized organizations. Reluctance among people in colleges and departments to work together or share expertise and resources (i.e. silo mentality), lack of communication within and between organizational layers, and issues of proximity or geography can be barriers in large, organizations. Many of the ideas expressed under this theme came from those at the dean, associate dean, or department-head level. A dean expressed frustration with the challenge of communicating across the college and how it leads to misconceptions that fuel divisiveness:

> “I find communication a challenge. Our college…we have five departments, plus we house the [institute]. We're separated on two campuses... So physically we're rarely all together as a college. On the one hand, it's important to communicate messages to the faculty to enhance that collegial feeling across the departments. On the other hand, people get a lot of information every day. And how do you balance it? It can be overload.”

Perceived lack of communication can to hinder trust and collaboration in the work environment. According to a dean,

> "Sometimes it's very frustrating, because you feel like you've done nothing but communicate something and you'll interact with some faculty who will say, 'I've never heard of this.' 'Yes, you have heard it.' So I think the answer is you try different media…We have print media, we have electronic media. I go around to the departments once a semester to a faculty meeting and just talk about whatever they want to talk about, whatever's on their mind. But I think lack of communication can lead to mistrust. The departments meet regularly, they know each other well, but what I see is kind of misconceptions across, you know, between departments and then sometimes between our college and then other colleges, you know, and it's just kind of ignorance really. But I think we're always kind of working to prevent that sort of situation."

Three interviewees noted that geography and physical separation present real logistical barriers and impede faculty connections, leading to misconceptions or lack of awareness about the work of peers across the college or division. A division head in the public sciences said, "In a big division like ours… we're all over the place too, so we're not like in one big building. It's sometimes hard to know what people are working on and what they're doing." An associate dean in the natural sciences expressed a similar sentiment, "So a quarter of my department is here and three quarters is [elsewhere]. So that can be a bit of a barrier geographically."

Another department head talked about how, with physical separation, the informal communication or more natural connections do not occur, and this problem can hinder understanding and relationship-building. This interviewee said,

> "We have a distributed geography with some people whose laboratories are in the [first campus], some are on the [second campus], and those that are on [second campus] can be in different buildings. So there's some physical issues there that sometimes preclude easy connectivity in bumping into people in the hallway and just checking in on how-you are-doing kind of stuff."

When people do not know each other and do not have opportunities to interact, they can sometimes begin at a place of mistrust. One research leader described this idea in the following way,

> "Say a new dean is coming in. You kind of have to really win over their trust. And I think you can only do that by getting to know people individually. And that's harder. So when you're a department head, you interact a lot with your faculty. They interact with each other regularly. Once you move up to that next administrative level… I don't see most of our faculty on a day-to-day basis. They don't get to know me as a person. That in and of itself, that distance, breeds mistrust from faculty across different departments that don't know each other. They own it. It's like almost they automatically mistrust each other until they can interact."

Lack of communication does not always have to do with geography, but can be more of a reluctance among individuals in the organization to think beyond their

individual responsibilities and their unit. This idea, “silo mentality,” can be prevalent in academic settings where universities are set up and structurally funded by colleges, disciplines, divisions, and departments. Institutions need to actively address and encourage work and sharing across units. Talking about structures within the college, a dean expressed it this way:

> “…I think it's just a human tendency to form groups. And so I'm often trying to combat that and bring our departments together and…every time we have a college-wide reception or something, I am shocked at people who've been here for years but in different departments, and have never met before. I mean we have 150 faculty across the college. We're not that big.”

In many academic settings, administrative budget models tie funding to academic units’ and revenues and can be barriers to cross-departmental, cross-collegiate communication and collaboration. One research leader explained:

> “Like at any university, there are politics, and the politics are that we're a small college and we have…a number of really good departments, but two of our departments are with [a different college]. This is a source of conflict because there are research dollars, there's space issues, there's teaching recovery.

This participant went on to explain in more detail how the budget model inhibits collaboration saying,

> “And the budget models here are all really screwed up…One of the things that the budget model screws up is collaboration. So collaboration and teaching are completely out. Because if I have a class on research ethics and I want to involve

> somebody from [a different college]… who's going to get the tuition? How do we share that? …It seems like it's very difficult and is an impediment to collaboration."

Resistance to change and the inability to move on from past decisions were also a discussed by two participants as divisive elements that cause barriers to virtuousness in the research environment. One interviewee noted, "I think there's a lot of, there's some conflict because people, people don't like change. They resist change." Another research leader put it the following way,

> "I find that that, not all, but some faculty have an extremely long memory and I will hear stories about things that predate me by years, if not decades. Events that happened and they're hanging on. And the way they'll talk about it, you get the impression that it happened recently. When I was first starting…I thought, well that must have just happened like last year, a couple of years go, and you find out it was like a decade ago."

Lack of Transparent Decision-Making

Faculty members who are not necessarily in leadership roles expressed frustration with the lack of communication from leaders, lack of transparency in decision-making, and inconsistent follow-through on articulated priorities as being barriers to organizational virtuousness, particularly trust. For some of these individuals, what may appear to administrators as resistance to change or difficult behavior is actually frustration about inaction, mistrust related to past decisions, or a general feeling that their input is not sought or does not matter. Two participants mentioned hiring decisions as an

area of contention. One professor said, “There have been some sort of bruising decisions that have…I don't want to put emphasis on it because it's – in 26 years I'd say there have been like two.” This professor went on to say that, although these issues were few and far between, the resulting decisions really made many faculty members question the leadership of the department for years to come. In talking about the lasting impact of contentious hiring decisions that were less than transparent, a research leader said,

> “…Like hiring decisions. Things that were made, maybe that that didn't go through the standard search process…Maybe there was a special deal made to keep somebody or bring somebody in. And particularly in some of our departments, because the cultures are different, some of the faculty feel very strongly about faculty governance in general. And if a decision is made where they feel that faculty governance has been ignored or undermined, they do not forget that. And then you have to, as a new dean coming in, you kind of have to really win over their trust.”

Frustration from collegiate and department leaders about inconsistent messages from the institutional level was also mentioned. One associate dean expressed it in this way:

> “This is where I have a beef with the institution…They'll come out and tell you that they love diversity and they want to support it, but… don't want to pay for it. If you want to promote diversity in your lab by recruiting a student from Mexico here and they're a visiting student, can you get help to pay their health care? No. Can't do it. If they get a fellowship, can we get support for their healthcare?

> Nope... And so they have sort of, they like to talk about it, but they don't actually do it."

Pressures and Expectations

Pressures and expectations related to workload, competition for funding, tenure and promotion, and the inherently competitive nature of academia also hinder or raise barriers to the elements of organizational virtuousness. The virtue of integrity was most frequently noted by participants. One professor, speaking passionately on this topic said,

> "I have become increasingly concerned…just profoundly alarmed, I guess is the better way to put it, about the way expectations of what a successful career as a researcher at a R1 university looks like. The way those expectations have escalated over my career – and, I got in early enough so that it has not impinged on me – but I see younger people coming in and…the numbers of publications and impact factors and these really profoundly misleading measures of quality research."

This participant continued talking about pressures and expectations as a widespread problem permeating the entire academic community:

> 'We have these supposedly objective, obvious measures of a research program, which I think are profoundly distorting what academic research ought to be… I feel as a community of scholars, we've been remiss in curating what it means to do research at a university. And I think that must involve very serious pushback against administrators just wanting more and more and more and more and more.

> Starting from deans all the way up through the hierarchy. I wish I had started doing that earlier. I do it a lot now, but not to any obvious effect."

The consequences of heightened pressures and expectations, particularly new faculty members, can lead to questionable research practices. An institutional research leader said the following,

> "We want research integrity, but we often require so much of particularly newer or junior researchers that they don't have the time or energy or a sense of the most important thing… integrity, when they're under pressure to get the next grant, write the next paper and all the pressures we put on… So while leaders can talk of these virtues, the practice is more of a boot on the neck to get more money."

This interviewee went on to talk about the impact of this pressure saying, "So there's often a disconnect between what we say and then where the real and perceived incentives are, which creates things like research malpractice and other kinds of things that happen around the university all the time." Along those same lines, an associate professor put it bluntly, "It's hard to maintain integrity when you're being forced to do things or shortcut the system…Who knows where, along the line, that research is sacrificing so you can get that preliminary data to get in the grant to submit it on time."

Uneven distribution of workload was cited by a junior faculty member as an area that impedes collegiality and trust. This person said, "I'm a very junior faculty and I have a lot more masters students, advisees, a lot more on my plate than a lot of the very senior faculty. And that's pretty true across the board for junior faculty. And so I think there's a lot of resentment that builds up."

Emphasis on rewarding mainly publications or funding was another area creating resentment among faculty. To this point, an assistant professor said, “I think a lack of recognition for the amount of work that goes into working with students and doing service compared with getting a one-million-dollar grant, or publishing in a really big journal…I think if…we're going to celebrate those things, we need to celebrate everything.”

Securing grant funding was mentioned by more than half of interviewees as an area of stress and pressure. Articulating the issue plainly, one research leader said, “sometimes the money drives the research rather than the research drives getting money.” Expanding on this idea, another research leader expressed how pressure to constantly secure grant funding has become a driver of research agendas, and at times, can stifle creativity, innovation, and collaboration. Adding another dimension on the topic of grant funding and pressure, an interviewee discussed how the reliance on grants can be limiting to the quality of a study:

> “Another thing with funders, since we keep getting cut for grants…Sometimes it means…you might've been trying to do another arm of a study or something. You might have to short change the work, not the integrity of it, but say there was another element that would have added more depth or more analysis.”

On the topic of grants and reward systems more broadly, even when values of sharing, openness, and team-centeredness are promoted, interviewees spoke of the inherent nature of competition in academia creating pressures for individual success. One associate professor in the public sciences put it this way:

> "I've sometimes seen this tension between wanting to work as a team and wanting to be open and honest and collegial. And the… kind of inherent competitiveness that comes within academic environments where there's only a certain amount of funding to go around or awards or recognition or whatever it is. And I think…you could have an environment where everyone is mutually supportive and one person's success is seen as success for the whole team. I'm not sure I always see that play out that way in my department. I think one person's success is really seen as 'This person is a superstar and everyone should try harder to be a superstar.'"

Tenure and promotion were frequently mentioned as sources of serious pressure for researchers. One interviewee described it as a pressure-filled, "dangerous, dangerous time" when postdocs are trying to publish, secure grant funding, or going up for tenure and promotion. In talking about the virtuous elements as they relate to individual researchers, a division head in the public sciences emphasized that the work undertaken is done with integrity but the tenure and reward systems are where the weaknesses exist. This individual said,

> "I blame the tenure code…Well I blame individuals too, but I mean…The tenure code…it really rewards individual achievement as opposed to collectivism. So say that you're a faculty member in my division and I look at this tenure code and I say, 'So how many lead-author publications do you have? How many PI grants do you have?' …Even in the context of team science, I'm not honoring the

contribution… You're cultivating a culture of more like *Lord of the Flies* rather than *It Takes a Village*."

Most Salient Characteristic of Organizational Virtuousness

For the concluding question about the organizational virtuousness framework, I asked participants "*Overall, which characteristic or characteristics among these [integrity, trust, purpose, openness, collegiality] do you see as dominant or most salient in your college or department?"* This question refers to the elements of organizational virtuousness listed in Figure 1: Conceptual Framework, which include: purpose, trust, collegiality, trust, and openness. A total of 19 of the 20 interviewees answered this question. One participant listed two virtues (integrity and purpose) as an answer, and another individual selected all five of the virtues as being equally salient. Each of the five virtues were selected by at least two participants. Not inclusive of the one vote for all five virtues, integrity is the most frequently selected virtue with a total of six selections, followed by collegiality (four selections), and purpose (four selections), and trust (two selections) and openness (two selections). Table 5 displays the most salient organizational virtuousness characteristic by college.

Responses were mixed among the participants in the public and natural sciences, with a few patterns emerging. Table 6 presents the following: four of the six participants who selected integrity as the most dominant virtue are from the natural sciences discipline, while three of the four participants who selected collegiality or

purpose as the most salient are from the public sciences discipline. The two respondents who selected openness as most dominant are from the natural sciences.

Responses are also mixed when filtered by research role with a few patterns emerging. Respondents who selected collegiality are either at the professor or departmental leader level. The two individuals who selected openness as the most dominant virtue are both associate or assistant professors in the natural sciences. Integrity is selected by at least one individual at each research role level and purpose is selected at every level except departmental. The participant who selected all five virtues is at the collegiate leadership level.

Some participants explained their responses to this question. A majority of respondents explained that, regardless of which virtue they selected as most salient, it either encompassed or provided the foundation for the other virtues. Two participants talked about purpose being the virtue that brings everything together. An associate dean in the natural sciences said,

> "I'm going to pick purpose. For me, purpose can encompass all the other four. We're a research university. We have to have integrity and openness and trust and collegiality to achieve the purpose."

Table 5: Most Salient Organizational Virtuous Characteristic by College

	Public Science	Natural Science	Total
Integrity	2	4	6
Collegiality	3	1	4
Purpose	3	1	4
Trust	1	1	2
Openness	0	2	2
All	0	1	1

Table 6: Most Salient Characteristic of Organizational Virtuousness by Role

	Collegiate Leader	Dept Leader	Professor	Associate or Assistant Professor	Total
Collegiality	0	2	2	0	4
Trust	1	1	0	0	2
Openness	0	0	0	2	2
Integrity	1	1	3	1	6
Purpose	2	0	1	1	4
All	1	0	0	0	1

Similarly, an associate professor in the public sciences said, “I think purpose. I think the reason that we're all here doing this work and if we can have one unifying purpose, I think the other things sort of fall in line behind that.” A division head in the public sciences who chose collegiality explained,

> “Yeah. I would say collegiality is the biggest issue…What does collegiality means? It doesn't just mean playing well with the other children, but. you know, having respect for other people's opinions, their science, their teaching…their approach to things. It’s also always the hardest thing to maintain, I think, in an academic environment. Because everybody is known to be independent.”

This individual went on to say, “If you establish true collegiality…based on mutual respect and willingness to engage in discourse, which – part of collegiality is agreeing to disagree – then that sets the stage for most things to go well.”

Of the two individuals who chose openness, one said, “Most important one that I will say is openness… So, if you have openness, then everything else can follow. If you don't have openness, everything else becomes a question.”

A department head in the natural sciences chose trust as the most dominant, explaining it as a necessary element with regard to faculty and departmental leaders:

> “Don't trust and integrity go together pretty hand-in-hand? I think the faculty [members] have to have a deep trust in the decisions that the leadership make. Much of leadership is judgment calls made on a day-by-day basis in real time. If all that leadership…was counting votes at committee meetings, you wouldn't need

> leaders. So people have to have a level of trust that the decisions that leaders made, or are making, are made in the best interest of the unit."

The participants who chose integrity to be the dominant virtue explain it as being first and foremost necessary, with the others following. An associate dean in the natural sciences put it directly saying, "From my lab, integrity is number one."

A professor in the public sciences identified it as both an individual trait and environmental trait:

> "I would say probably integrity, like folks hold themselves to a high standard of doing really rigorous research, be it qualitative or quantitative….So I would say that we really hold integrity high up on the list and I would say we all still are fairly individualistic in that way and have our, kind of, our, not really cliques, but groups of folks that we work well with. And so I wish we were higher on the collegiality end of things, but, I think we're moving in that direction, which I think again, is going to be the crux of that on these two…I would say, as a unit, I would say integrity would probably be the highest of these values."

Others indicated that integrity as an individual virtue may be the most dominant, but as a department or unit, some of the others might rise to a higher priority. A professor in the public sciences said, "I think integrity is most important to most individuals. I mean, I think as a departmental entity, I think purpose probably overrides it." Similarly, a division head in the public sciences said a lot of attention is paid to integrity so it may be the most dominant, but, as a unit, they are really making efforts to focus on purpose:

> "I think integrity…There's a lot of attention paid to that. And just the type of people that we attract, operate with a strong sense of integrity. I think we're working towards understanding better our purpose. Why we're doing our work. Part of that is reminding that we're a Land Grant, we're here to improve the health of the population. It's not to have 300 publications, you know, that's good. But for what purpose?"

The participant who said all five virtues are equally salient explained by saying that all are necessary:

> "I think they all are. I don't think that I would put one ahead or two clearly ahead of the rest. And I think…if you don't have one, the others sort of kind of fall apart in my, in my view."

Conclusions on Organizational Virtuousness

All of the interviewees except one expressed a strong initial connection to the organizational virtuousness characteristics of integrity, collegiality, openness, purpose, and trust, using words like important, central, aspirational, and foundational to describe their impressions. Responses and examples given by interviewees most often emphasized the themes of collaboration and direct interactions. Formal ways to promote positive interactions and support the virtues in the research environment include instituting a code of conduct, individual development plans, formal mentoring groups and activities, and opportunities to learn about one another's research on a routine basis.

Informal interactions as well as recognition of values and norms were also frequently discussed as ways to promote a virtuous environment. Awards, newsletters, announcements of professional or personal achievements, retreats, and social engagements where people come together and get to know one another all have the potential to facilitate trust, openness, and a shared sense of purpose in the eyes of the study participants. Leaders who show respect, listen, and involve others as part of decision-making processes represent another category of responses with regard to fostering the elements of organizational virtuousness.

Negative interactions and the lack of personal connections create barriers to organizational virtuousness. More specifically, difficult people who are averse to change or collaborative work were consistently cited as a barrier, along with reward structures and characteristics of academia that create pressures, competitiveness, imbalanced expectations and siloed thinking within the research environment. Lastly, physical or geographic barriers that limit interaction among researchers and make natural connections and collaborative work more challenging were cited as things that have the potential to hinder elements of organizational virtuousness.

Connections Between Organizational Legitimacy and Organizational Virtuousness

Connections or areas of overlap between organizational legitimacy and organizational virtuousness came to light in direct and indirect ways throughout the interviews. The final portion of the interview was an explicit discussion about the two frameworks, together. Participants were shown Figure 4, a simplified model of both

frameworks, and asked directly whether or not they saw connection, and, if so, in what ways. The specific questions posed were: "*What connections do you see between the internal and external elements we've discussed? Do you have examples or stories to illustrate how these frameworks and their elements might be connected? Can you describe how you think they may be connected?"*

Chapter 3 presents three competing hypotheses with regard to the relationship between the two frameworks: 1) congruence signals agreement, compatibility, and consistency with strong and direct connections between frameworks, 2) independence represents the idea that an conceptual barrier exists between the frameworks and they operate independently of one another, meaning formal rules and institutionalized activities do not reflect and support actual daily activities and behavior, and 3) partial connectedness represents the idea that the frameworks are independent but have the potential to support one and other or align and reinforce each other in various ways.

All interviewees responded positively when asked whether they saw some type of a connection between the two frameworks, and so the hypothesis of independence was not supported. Responses varied with regard to the strength of connection, specific areas where connections exist, and the direction of influence between framework connections. A majority of participants described connections between organizational legitimacy and organizational virtuousness elements as existing, but in both predictable and unpredictable as well as general and specific ways.

While many participants made statements that closely align with congruence, the most strongly supported hypothesis overall among interviewees was partial

connectedness. When asked directly whether the frameworks are independent of one another, a department head in the natural sciences answered definitively that they were not, but also added, "…but they're not formulaic in terms of…A leads to B leads to C." Similarly, an associate dean in the public sciences said, "…I think they're connected. I think maybe what it is…I'm not sure that they're parallel." A professor in the public sciences described the connection as more general or high-level saying,

> "…I think they are connected. I think there is a sense of responsibility of being in a place like [this University]. I can't say I speak for every professor, but I think in a sense we recognize that we have a standard that is expected of us, and while there may not be a specific system that's monitoring what we do and how we do it, there is a general system, meaning the peer-review process and the funding process…"

An associate dean in the public sciences talked about a gap in the connection between policy and process, where researchers may agree with an externally mandated policy in concept, but implementation and translation of the idea was where the complexity exists and where there is frequently less guidance:

> "So like whenever there's a law that's passed, so they pass a law that says you must do this. And then the first thing as my friends at the state and my former students would say…they get together to figure out rulemaking. We'll make it like 'How are we actually going to enact this? How are we going to make this actually work in process, in process? What does it mean?'"

A professor in the natural sciences labeled the external rules to maintain legitimacy as perfunctory, describing the connection in this way,

> "I guess I'd say that…reporting to funders and having permits, they're sort of bare minimum, honestly. I mean, it's all…kind of fiddly things that have to be done and it's always a little…we've got to do this, but, it's sort of the minimum."

Reiterating this point and drawing a connection but also a distinction, this interviewee said,

> "…I think it's probably important to be asked to do them [permits, reports to funders] so that we're conscious of them, but again, I think they are more sort of baseline, whereas these [virtuousness characteristics] are sort of constant daily, hour by hour, honestly…ways of behaving that… you can't just sort of check off."

A dean in the natural sciences talked about the actions to achieve legitimacy as a response to breakdowns in integrity, in order to support the aspired virtues saying,

> "My impression is that the external legitimacy pieces have been put in place over time to try to ensure that the virtuousness exists and probably at least sometimes in response to these things having broken down… It's like you would expect…Well of course we all have these internal features that are what we aspire to as an excellent research university, but when there are examples of things falling down or falling apart, then the powers that be say, 'Okay, we need to put in something formal to make sure that these elements exist even under non-ideal circumstances.'"

Three interviewees characterized the connection as being stronger, with tighter alignment, closer to congruence. According to a research leader in the public sciences,

> "I see these two slides or decks, idea sets, as inextricably linked, fundamentally tied, left and right, peanut butter and jelly… In my head there's almost a dance between the virtuous within the organization and the legitimacy without or externally."

This leader went on to describe how each of the elements of the framework connect from a high level:

> "Social responsibility is critical. You're not going to have that without purpose and openness and so forth…Social responsibility for funding a public research university. There is a responsibility for the typical taxpayer to offer taxes to say we value these things as a culture, as a society, a state, whatever you want to say… And public trust in the organization…Legislators aren't going to intervene on the internal workings of the university. The university will do its own governance…So that's the trust that the experts inside the walls know what they're doing. And of course confidence in research is a dance between the internal people doing all the scientific and artistic openness and so forth, so they can trust it. And the confidence, I think going the other way such that the system, often through NIH or NSF or whatever, is saying 'We have confidence, here's more money, keep going.'"

Emphasizing a tight connection, this interviewee concluded by saying,

> "…So these two idea sets for me are almost a false dichotomy in that you have an internal and external. I see the boundaries far more porous. It's not a bad intellectual exercise to keep separate. It's clarity, right? But push comes to shove, it's more of a mush in my head. A technical word, mush."

A division head in the public sciences expressed similar perceptions of a strong relationship between the frameworks, with particular emphasis on the connections between social responsibility and purpose:

> "They go hand in hand…We like to think of ourselves as a global, land-grant institution and we need to be generating new knowledge that will make their lives better. And so we cannot do our job…and have a functional happy group, without being able to do the research and do the education in a way that has legitimacy in the public side…that we're meeting their needs. When we say that we're doing research, it's going to be for the betterment of the people of [this state] and in the world…"

Direction of Influence

Interviewees who provided examples or detailed connections also often described the direction of influence between the two frameworks. A dean in the natural sciences talked about how, in theory, if you had the virtuousness characteristics, you would not necessarily need the compliance aspects:

> "At some level, the external pieces do influence what goes on internally. Maybe not at as deep a level as one would hope…I think there are ways that you could be fulfilling the formal requirements of compliance without really meeting it or

> without really having it be central to your behavior…Where it's not as sincere as one could hope. And I think ideally you start with these [organizational virtuousness elements] and if you really had all these, you probably wouldn't need so much in the external category. It would just come more naturally."

A professor in the public sciences noted that external forces can influence internal processes, but that the stronger influence is from the internal environment:

> "I was influenced by the culture…that it has an impact on how I conduct my research and how I perceive my social responsibility, or my responsibility to funders and the public, and my drive to communicate my research findings to make sure it's understandable by the public and most useful. I think it definitely, for me…organizational environment affects the interaction with the outside world…"

In contrast, an associate dean in the public sciences expressed a contrary point of view about the direction and strength of influence of external on internal behaviors saying,

> "I do think they're connected because I think some of these external things, again, IRB I think is a really good example, or other federal regulations. If you're going to do an investigational new drug or a device, you have to do a lot of work before you can do that. It makes people think about what they're doing. And I think that's very important. It's a standard."

A division head in the public sciences described the relationship as circular:

> "The external influences how well we can do with our jobs, and when people are frustrated because they can't get funded to do something, they can't get people to participate, they can't get people to believe that the results of the research they come up with are meaningful. If you go and present information to some decision-maker and they just tell you, 'Oh, that's just your bias.' It's actually not our bias, it's the truth, but it's – they don't want to listen to or hear it. That's frustrating. So I think this [organizational legitimacy] has a bigger impact on this [organizational virtuousness]."

Then, explaining the influence in the other direction, this respondent said, "If we had a reputation of…poorly done the research or…that didn't produce a good product for education, or our graduates were incapable of doing their jobs, then we would certainly harm the public trust."

An assistant professor in the natural sciences described the connection as reciprocal, starting with internal culture:

> "I think they have to be connected and I think it starts too with just a healthy culture within the department. If we support that openness and trust here, I think you're much more willing to share that outwardly. If you can trust your colleagues, maybe then you've built a support system and then…you're going to have additional trust moving out. And then the reciprocal, as I said, the way the funding has changed, we're also receiving money from very different sources… so we have to get that information out if we want to continue to receive from them. And so that requires some trust and willingness to work with them."

A dean in the natural sciences described the connection in terms of authenticity and formalizing what should already exist:

> "I would say if you don't have these [organizational virtue elements] then this [organizational legitimacy] is just window dressing…and is undermined …because then the legitimacy pieces are inauthentic and you're just going through the motions. Whereas if you have this [organizational virtuousness], you know… through your organization, the organizational legitimacy pieces are a way to just formalize that."

There is an expectation and assumption that these two frameworks are connected. An assistant professor in the public sciences talked about the connection in terms of living up to society's assumptions:

> "I think they're definitely connected and I think if you have these pieces in place, then you're going to be doing better work across the board individually and collectively. And so I think if you're doing better work, then you're achieving all of these more easily. I also think externally…there is an assumption that these things are happening…Academic institutions are nice places to work, where you have lots of passionate people engaging around a topic. And I think people assume that comes with a sense of purpose and integrity and trust. And so I think as part of our social responsibility, we need to live up to that expectation."

Overall, a majority of the responses about connections between organizational legitimacy and organizational virtuousness suggest some level of alignment between the external expectations, rules, and standards that govern responsible research and the

internal culture and climate of the research environment. No participants agreed with the hypotheses that each framework operates independently. Evidence of connections are stronger when perceived as applicable to addressing the immediate needs of researchers in their work environment (e.g. mentoring groups, open tenure processes, electronic record-keeping, etc.).

CHAPTER 5

DISCUSSION

A university supports the integrity of its research through a formal system of rules, systems, and oversight mechanisms. Twenty faculty researchers and research administrative leaders from two colleges at a top-tier public research university participated in interviews for this study on connections between the formal research compliance mechanisms and internal organizational activities that influence the daily decision-making of researchers.

To explore this connection, the conceptual framework for this study relies on two theoretical constructs: organizational legitimacy and organizational virtuousness. Organizational legitimacy reflects the formal structures (e.g. laws, policies, programs, systems, positions) that exist at a research university as a manifestation of public expectations (Meyer & Rowan, 1977). Organizational virtuousness reflects the positive and aspirational elements of an organization used to guide behavior, attitudes, performance, and excellence from an internal perspective (Cameron et al., 2004).

The findings of this analysis respond to the research question: *How do researchers' and administrators' perceptions of the formal actions taken by a research university to achieve organizational legitimacy relate to their perceptions of the factors that represent organizational virtuousness in the research environments at the institution?*

Participants characterized the elements of organizational legitimacy (social responsibility, public trust, public confidence, meeting societal expectations) as central to the overall credibility of a research university, as well as fundamentally tied to the mission of the organization, particularly in a land-grand institution. They perceive their role as being stewards of public funds with a responsibility to advance knowledge and address societal needs. Financial accountability and fiscal responsibility for public funds was the most common theme emphasized by participants related to trust and confidence in research and the achievement of organizational legitimacy.

Organizational legitimacy means different things to different stakeholder groups. Participants discussed two general groups of external stakeholders with differing expectations related to trust, confidence, and social responsibility in research: those who are external to the university but play an active role in the academic research enterprise (funders, journals, professional associations), and the general public. For the general public, the systems and oversight mechanisms that exist to ensure the responsible use of public funds are a necessary layer of administrative checks and balances built into the research system to ensure that taxpayer funds are being used responsibly. This group of stakeholders relies on the academic stakeholder group to oversee research activities. The existence of this administrative layer promotes a sense of organizational legitimacy among the general public, but what is most important to this stakeholder group is how the research can be applied and whether or not they deem it to be useful in addressing an individual or community need.

Participants of this study consistently reported the perception that the general public has limited understanding of the complexities of research, which is often a barrier to organizational legitimacy. The fact that research is evolving and builds from previous findings is not commonly understood outside of academia. When this confusion is coupled with media oversimplification about research findings or with religious or political beliefs, it fuels skepticism and mistrust among the general public. There is a need for institutions and researchers to better communicate the complexities of research and study findings with the public in a more direct and effective manner.

The public does distinguish between institutional behavior and organizational events. Negative events that are related to university in some way are more often publicized, and this which can compromise the overall credibility and reputation of the university. More direct, frequent, and meaningful interactions between the general public and researchers, where the media is not the main communicator, may assist in alleviating mistrust and strengthening perceptions of organizational legitimacy.

For the academic external stakeholder group, achieving organizational legitimacy is associated with the actual research practices and standards that exist in the immediate research environment. Gaining the trust and confidence of funders and journals is tied to having methodologically rigorous research practices, ethical professional norms, and being scientifically productive. Tools and processes to maintain sound lab records and manage data are all instrumental in maintaining positive relationships with external entities, and in turn, promote organizational legitimacy. Additionally, participants consistently noted that the specialized expertise and training of researchers as well as the

size, status and comprehensive portfolio of a research-intensive university convey legitimacy to funders and other external stakeholders in the academic enterprise.

Interviewees also strongly identified with the construct of organizational virtuousness, characterizing the five virtues (purpose, integrity, collegiality, trust, openness) as foundational, fundamental, and aspirational. Phrases like “fitting,” “what we want to be,” and “values we collectively hold” were expressed by interviewees. Collegiality and integrity were the two characteristics most often initially discussed with specific examples, and interviewees described the idea of getting along and working together as critical to a desirable and productive research environment. Direct interactions with others and collaborative research were common themes related to the idea and achievement of organizational virtuousness.

Participants were easily able to provide examples of the ways the organization seeks to promote the five characteristics in both formal and informal ways. Regular reinforcement of values and norms through award programs, announcements, and mentoring programs were some examples cited by participants of this study. Conversely, lack of meaningful interactions among organizational members, reward systems that promote competition, and administrative structures that foster siloed ways of working were noted as environmental factors that create barriers to virtuousness. Difficult people who are averse to collaborative work and changing expectations also create barriers to desirable work environments and can hinder collegiality and openness in the work environment.

All study participants agreed that some degree of connection exists between organizational legitimacy and organizational virtuousness. Three hypotheses were presented to characterize connections between the two constructs (congruent, partial, independent). None of the interviewees characterized the constructs as operating completely independently from one another. Most of the participants described a partial connection between the external and internal elements, indicating that, while these may be two separate ideas or have different purposes, they support and reinforce each other in certain contexts.

Discussion

Many of the findings of this study validate and add to earlier research on organizational legitimacy, organizational virtuousness, and environmental influences on individual behaviors in organizations. This study extends the literature on researcher conduct, and on approaches to managing and ensuring the integrity of research. This study builds on the existing literature by exploring how actions to achieve external approval connect to the daily work and interactions of scientists at a research university. The theoretical underpinning used in this study was developed to offer a new way to explore problems in research and the management of integrity; however, the findings provide insight on exploring connections between external and internal organizational influences in decision-making and performance more broadly.

The literature reviewed for this study details the evolution of approaches in the management of research integrity, which began with sole reliance on implicit standards

of conduct and self-regulation and developed over decades into the vast regulatory system with required oversight mechanisms that exists today. Much of the literature in this area characterizes approaches to ensuring integrity as reactive, with emphasis on the detection of misconduct or egregious misbehavior (Yarborough et al., 2009).

A gradual shift to prevention and deterrence took shape over time, and the 1989 release of the guidebook *On Being a Scientist*, catalyzed new approaches that focused on educational requirements in the responsible conduct of research for universities to implement (Tamot et al., 2013). Education in responsible conduct has become an integral part of research training programs; however, evidence of its effectiveness as a strategy to alleviate problems in research is uneven and equivocal (Kalichman, 2013). As the literature has evolved on this topic, what has become increasingly clear is the lack of analysis of how influences external and internal to the research environment connect to behaviors and decision-making.

This study extends the literature on this topic by going beyond examination of approaches used to address or deter problems in research. It offers a new lens by which to explore the various layers of influence that connect to the decision-making of researchers in their daily work. This study also adds credence to and extends the recommendations outlined in the pioneering *Responsible Science, Volume I: Ensuring the Integrity of the Research Process* (1992), as well as the more recent National Academies of Sciences *Fostering Integrity in Research Report* (2017), that calls on research institutions to manage research environments by creating and sustaining a culture of integrity. My examination both supports and extends the ideas that the internal culture of an

organization is based on actions of its members and is linked to the systems created to achieve desirable organizational elements and characteristics. This investigation offers a demonstrable way to depict an organizational "culture of integrity" (Gunsalus, 2018).

Findings from this study also affirm the idea that the legitimizing of organizations is dependent on the present interests of external stakeholders, and organizational survival relies on meeting these expectations (Dowling & Pfeffer, 1975; Meyer & Rowan, 1977; Parsons, 1960). In line with Parson's (1960) and Dowling and Pfeffer's (1975) view, an organization justifies its existence through activities to display norms that are acceptable to a larger social system.

This study found that external stakeholders are divided into two broad groups: those that are external to the organization but part of the research enterprise (e.g. funders, regulators, journals), and the general public. The findings of this study support the idea that the research enterprise's external partners act as a layer of legitimacy buffer to represent the interests of the general public. Though the general public may not be as keenly aware of the intricate systems and regulations in place to ensure responsible research, they are aware that an oversight system exists, rules are in place, and researchers have specific training and expertise that legitimizes the work they do. Permits to conduct research, administrative reports on research activities to funders, data management practices and disclosures, and education in the responsible conduct of research were listed by study participants as part of a larger oversight system designed to legitimize research activities to external stakeholders. They further confirm the idea of organizational survival being connected to external expectations.

Findings from this study also support Dowling and Pfeffer's (1975) view that legitimacy in organizations is dynamic and shaped by events and factors external to the organization. Legitimacy is more of a constraint for certain types of organizations because of their reliance on social support. In the context of higher education, findings support the idea that the social and political environment interacts with and often constrains the immediate research environment. Of particular emphasis was how social values play a role in the activities of researchers in the public-science discipline. The social and political climates often dictate what type of research is accepted more broadly and, in turn, what pathways of research will be publicly funded and how research will be interpreted and applied in the public sphere.

Extending Dowling and Pfeffer's (1975) view that certain types of organizations are more constrained by external pressures and expectations because of their reliance on external support, this examination also found that the general public does not distinguish among institutional events that may or may not be related to a singular topic, in this case, research integrity. In other words, when a negative event associated with the university occurs, this one event has the potential to affect the overall legitimacy of the institution in the eyes of the general public. A crisis or scandal of any kind at the institution that is made public through the mass media can create broad external mistrust about the institution as a whole, even if it is wholly unrelated to research activities. Organizations must continually tend to their legitimizing activities through direct and meaningful interactions with the public and adapt to ever-changing expectations that reflect the broader culture.

Also affirmed by this study and adding to the growing body of literature on this topic is the idea that factors and forces in an individual's work environment can foster (or hinder) specific characteristics of an organization's culture. Confirming Vallett's (2010) view on organizational virtuousness in a higher education context, desired virtues in an organization are manifested through both the decision-making of its actors and the systems and processes designed to support these actions. This study applied a new five-factor model of virtuousness, specific to the research environment, that study participants described as fitting, central, fundamental, and aspirational to the research environment.

As detailed in Chapter 2, there has been a great deal of examination of pressures and influences in the research environment and the behavioral aspects of conduct and decision-making. Extending Gellar et al.'s (2010) view that compliance is only one of many aspects that constitute an ethical institutional culture of research, this study finds organizational culture to be more complex and dynamic in the minds of research actors. This study also found support for the idea that an organizational culture that is perceived to be overly rules-based can create barriers to trust, openness, and collegiality in the research environment.

Extending these ideas, this study also finds alignment with aspects of the literature in the field of behavioral economics that highlight the complexity of individual decision-making more broadly. Behavioral economics emphasizes the idea that people do not always behave rationally and can be influenced by elements in their immediate environment. Proactive approaches through small, ongoing interventions can motivate or "nudge" people to behave in desired ways (Ariely, 2012; Thaler & Sunstein, 2009). The

literature on behavioral economics supports the idea that honesty is a mindset that can be successfully promoted through individual commitments and ongoing reminders embedded in processes and activities (Ariely, 2012). Affirming this idea generally, participants in my study listed things like the implementation of a code of conduct, the creation of individual development plans, and weekly research groups as examples of activities that promote trust, integrity, collegiality, and openness in the research environment and can serve as ongoing strategies to reinforce accepted values and norms.

My research also broadly affirms aspects of the literature that align with evidence about the effects of social pressure on individual behaviors and organizational culture (Ariely, 2012; Adams & Pimple, 2005). According to Ariely, in many areas of our life, we look to others to learn what behaviors are appropriate and inappropriate. Though this external focus can work to increase dishonest acts, there is also evidence that social pressure can be catalyzed to promote desired behaviors and commendable acts (Ariely, 2012).

Similarly, Adams and Pimple (2005) suggest consideration of an "opportunity framework" used in criminal justice settings, to control decision-making in organizations and deter or prevent negative behavior. An opportunity framework places greater emphasis on situational factors that restrict opportunities for misbehavior and enhance opportunities for desirable behavior. Adams and Pimple (2005) theorize that it may be easier to control and change a situation rather controlling and changing an individual, and organizations can use informal social control to "maintain conformity with the organization's unwritten rules" (p. 233). Consistent with the findings of this study, they

recommend organizational activities that facilitate positive social interactions and organizational processes that reiterate desired social norms to deter unethical behavior (Adams & Pimple, 2005).

More specifically, findings from my study align with and extend these ideas to the research environment, with heavier emphasis on activities that promote desired behavior rather than activities that alleviate bad behavior. Study participants discussed award programs, peer mentoring, research groups, announcements of achievements, departmental retreats, and social engagements as activities that are widely used to promote social norms and values in their respective departments and colleges. Organizational leaders and those who serve in mentoring capacities all have the opportunity to model values and behaviors that promote desired decision making and create a virtuous environment.

Findings from my study also support and extend the current work of Gunsalus (2018) that underscores the idea that tending to internal culture should occur in tandem with creation and implementation of formal research conduct rules and policies. Formal rules are perceived as more relevant and applicable if greater alignment can be realized. In other words, rules are more supported by researchers when they are perceived to address real-world researcher needs. According to Gunsalus (2018), multiple-choice , one-size-fits-all compliance training is not viewed by researchers as a relevant form of responsible conduct of research training. Training should be tailored to the audience, interactive, connected to the work, delivered by respected researchers, and continually assessed (Gunsalus, 2018).

The hypothesis of a partial connection between external elements reflecting legitimacy (rules and oversight) and the internal systems and activities that reflect a virtuous environment was the mostly highly supported connection by research participants of this study. Most participants did not describe a parallel one-to-one connection between the rules they are externally required follow, however, many were able to cite instances in which external requirements motivated them to act in a certain way. These findings extend Gunsalus's (2018) view that rules are more easily accepted by researchers and will therefore have more influence on researcher behavior when they are perceived to meet actual needs of researchers.

When asked about activities that promote organizational virtuousness, participants of this study provided examples that align with and are similar to the "real-world needs" cited by Gunsalus (2018) such as: mentorship support, good lab practices, getting and giving credit in collaborative arrangements, guidance on choosing a mentor, and navigating many of the inherent complexities of conducting research. According to Gunsalus (2018) and further affirmed by my study, organizational change occurs by highlighting bright spots in combination with support for leaders to make structural changes to support the desired internal organizational values and norms. Continuous attention to tone and meaningful interactions among organizational members are necessary to achieve the desired characteristics of an organizational culture.

Finally, beyond the context of research conduct, findings from this study acknowledge connections and suggests new ways of approaching issues related to organizational performance and organizational effectiveness. Cameron et al.'s (2004)

investigation of 16 industries revealed relationships between the five virtuous factors and identified measures of performance within those industries, such as profitability and customer satisfaction. More recent literature from Cameron and Plews (2012) and Cameron and McNaughtan (2014) suggests a relationship between organizational performance and activities that contribute to society more broadly. Similarly, the adapted five-factor scale of virtuousness was used to explore performance from the standpoint of activities that promote or hinder desired decision-making in research environments. This study aligns with Vallett's (2010) suggestions that factors of virtuousness could be used to examine and reveal associations with other specified performance measures in non-profit settings.

Implications for Theory

Research on research integrity has typically followed the evolution of approaches to manage integrity by focusing on the analysis of policies and practices that address detection and prevention of misconduct, narrowly defined as fabrication, falsification, or plagiarism. More recent literature has revealed that the more prevalent, less egregious misbehaviors (e.g. selective data reporting, significance mining, concealing conflicts) may be more damaging to the scientific enterprise (Fanelli et al. 2009; Martinson et al. 2005; John et al. 2012). The literature also suggests that environmental traits and the climate and culture of an organization may be more strongly correlated with these lesser offenses (Crain et al. 2013; Fanelli et al. 2009). This study was motivated by a desire to

consider the myriad of influences on the daily decision making of researchers and offer new insight for the management of research integrity at research universities.

A New Theoretical Perspective

The most prominent theoretical implication of this study is the development and use of a conceptual framework that recognizes the complexity of influences in the research environment. The framework connects two parallel constructs, one reflecting the external elements and influences of an organization, and the other reflecting internal characteristics and influences in an organization, to the problem of research integrity. Following the direction of the literature, which suggests that deeper examination of pressures and influences in the research environment is needed, I developed a more sophisticated model to examine research integrity at the organizational level closest in proximity to the scientist.

The conceptual underpinning for this study recognizes structures, pressures, and barriers that directly and indirectly shape the actions, practices, and everyday decision making of researchers. Findings from this study articulate a new direction for research on research integrity, shifting the focus from oversight and compliance to exploring elements and characteristics in the research environment that support or compromise research integrity and ethical behavior.

Additionally, study participants identified a partial connection between the two constructs of the framework that reflect external and internal elements. The connection between organizational legitimacy and organizational virtuousness was most often described in a high-level and general way. Most interviewees agree that an overarching

system of monitoring and regulating research activities is needed. They view the funding and peer review processes as critical to holding institutions and researchers accountable in their work; however, participants also consistently described the existence of a gap between the intent and implementation of policy and the actual research practices. Interviewees also consistently described the external rules as the baseline or bare minimum standard of conduct, and the characteristics of organizational virtuousness as the aspirational standards and behavior.

Answers varied in terms of the strength and direction of influence with regard to connections, but none of the participants supported the idea that each construct operates independently. These overarching findings suggest support for and use of this theoretical underpinning (organizational legitimacy and organizational virtuousness) to further examine pressures and influences in the research environment, as well as the relationship between externally reflected elements and internally reflected characteristics of organizations more broadly.

Adaptation of the Five-Factor Model

Organizational virtuousness represents a positive work environment leading to desired performance, behavior, and productivity (Cameron et al., 2004). Cameron et al.'s (2004) version of this construct uses a five-factor model with measures of optimism, trust, compassion, integrity, and forgiveness. It has been studied primarily in the corporate, and for-profit organizational context. Vallett (2010) explored organizational virtuousness in a higher education context, finding three of the original five factors (compassion, optimism, integrity) to contribute to overall virtuousness in a higher-

education context, along with three additional factors (benevolence, profound purpose, and joy) which Vallett attributes to the non-profit organizational type (2010).

My study offers an adaptation of the foundational five-factor scale to the specific context of a research environment at a research university. The factor of optimism, defined as organizational members feeling as though they are making a larger societal contribution in their work, was reconceptualized to purpose. Compassion, described by Cameron as care and concern for colleagues, was reframed here as collegiality. Forgiveness underscores the value of learning from mistakes, and was identified here as openness in the research environment. Integrity and trust were retained as relevant to the research context.

The overall concept of a "virtuous" research environment with defined traits was favorably accepted by participants. Furthermore, interviewees articulated strong agreement with the adapted factors of purpose, integrity, collegiality, openness, and trust as they relate to the context for this study. Initial reactions from a majority of participants signaled agreement, and as a result, the interview questions that followed elicited rich examples and insights that were relevant to the context being investigated.

Participants of this study were able to easily provide formal and informal ways in which these characteristics are promoted or hindered within the organization, in this context. On the formal side, advisor-advisee contracts, codes of conduct, individual development plans and other overt statements of values and norms were cited as effective tools to convey and promote desired ways of behaving and working in the research environment. On the informal side, ongoing dialogue and conversation about research

processes and standards of practice was commonly noted as a way to facilitate openness and trust. Also noted by participants of this study was the idea that research norms become most apparent when they are violated, but can spur on necessary discussion about what is and is not acceptable behavior.

Study participants also consistently noted the evolving expectations of external stakeholders for research to be collaborative and interdisciplinary. More than half expressed the idea that the nature of research today requires them to work in teams. As a result, collegiality, trust, and openness are critical to the research environment and formal faculty mentoring programs, weekly talks and seminars, and activities that bring researchers together to discuss their work and expertise can be effective ways to promote organizational virtuousness. Similarly, the element of purpose resonated with study participants and they listed departmental retreats and meetings where strategic planning activities take place as being a way to collectively think about the goals and purpose of their work.

Implications for Practice

In the specific context of research integrity at a research university, findings support the idea that management of responsible conduct should focus on aspects of the organizational environment that have the potential to influence individual behaviors. As institutions are being called on to create and sustain a culture of integrity, this exploration provides a model that identifies the critical cultural elements and identifies specific activities, listed by researcher leaders and researchers, that promote or hinder the existence of virtuous characteristics. These findings move the discussion beyond

approaches that emphasize compliance, rules, and one-size-fits all strategies, to approaches that focus on addressing the real-world needs of researchers.

According to the National Academies *Fostering Integrity in Research* (2017), extensive literature over the last three decades has identified what it means to practice responsible science, and these practices need reexamination to reflect the realities of the scientific world. In light of new technology and other modern advancements, practices around data handling, communication and publication, interdisciplinary and collaborative work, and research training as well as problems with irreproducibility of results and other detrimental research practices, there is a need for standards of practice to be revisited and clarified.

What this study adds is a more recent delineation and interpretation of current practices in the environment from the perspectives those who practice and administer research, and recognition that external pressures and forces have potential to connect to internal activities in positive and negative ways. It offers an updated look at what researchers and research leaders identify as best practices to guide in the consideration of how to shift research environments in directions of virtuousness, and in what ways practices actually connect to the ideas and standards that define responsible conduct in the research world. More specifically, this study offers informal and formal approaches for institutions to explore and consider more deeply in an effort to promote a culture of integrity.

Legitimacy

Participants of this study characterize the idea of organizational legitimacy as important and foundational to their work as researchers. Describing themselves as stewards of public funds and tying their work as researchers to a larger social contribution and the mission of a land-grant university, it is clear that systems and processes need to exist to continue to tend to the confidence and trust of the public. Though participants listed the compliance aspects of legitimacy as an important element in maintaining public trust, findings from this study clearly identify a need for greater attention to more direct engagement with the general public in communicating the research process as well as research findings. Rules and compliance serve mainly to tend to the relationship between researchers and those to whom they report (funders, regulators, sponsors, reviewers) on behalf of the broader public. Further exploration of methods and approaches that foster direct interaction could yield new ways to improve relationships as well as trust and use of research, possibly tempering the political nature of the current relationship.

Organization Virtuousness in Practice

This study's findings related to the practices that promote or hinder organizational virtuousness offer tangible contributions for decision making at a university. Formal and informal norms of conduct detailed by participants included instituting a code of conduct, an advisor-advisee statement, and an individual development plan. These practices, like the small, up-front interventions considered in the behavior economics literature, can serve as reminders to nudge individuals to behave in certain ways and make it easier for them to know what is considered to be standard and expected. Formalizing aspects of

informal practices like research groups, peer mentoring, and retreats where expectations norms are explicitly discuss and gray areas are openly address can support openness, trust, and collegiality in research environments.

A significant finding of this study was that the barriers to virtuousness in an organization are essentially the absence of the practices that were identified to promote virtuousness: a climate in which individuals cannot meaningfully interact and researchers feeling disconnected from the decisions made by administrative and institutional leaders was a universal theme. The main conclusion in this area is that researchers need to feel connected to each other, as well as to those who lead and represent them at the departmental, collegiate, and institutional levels. They need to have access to these individuals and be offered ways to contribute to decision-making and purpose-setting in order to feel as though their work environment is supportive, trustworthy, and transparent.

Finally, findings from this study support the extensive evidence that the inherent pressures and expectations of academia such as competition for funding, the tenure and promotion process, workload expectations, and publication productivity, create barriers to trust, collegiality, openness, and integrity in the research environment. Institutions must advocate, on behalf of researchers, for reexamination of performance measures that play a role in the problems permeating research environments. Institutions can begin implementing new systems that reward and incentivize activities like connectivity with the broader public and working in collaborative, interdisciplinary teams. Additionally,

strategies to make the tenure process more open and inclusive were detailed as a positive strategy by respondents.

Alternative Approaches

Behavioral economics offers a new set of standards for evaluating interventions that may have the potential to promote ethical decision-making. These standards recommend that institutions that aim to improve their ethical environments should consider using intentional, pervasive, research-based strategies that focus on everyday researcher behavior as well as the use of social pressure to encourage desired behavior in the work environment. Such strategies should aim to normalize responsible conduct over unethical behavior. Examples include: moral commitments (i.e. pledges, oaths), continual reminders of commitments, well-selected decisional default options, and a working environment with clear norms of acceptable and unacceptable behavior with positive peer pressures.

This study framed connections between the approaches to affirm legitimacy from the external stakeholder vantage point, and the activities and processes used to facilitate virtuous work environments. If these connections were better aligned with articulated researcher needs, they have a better chance of leading to desired researcher behavior. For example, responses to problems in research have typically led to more regulations and harsher punishments for investigators and institutions. Findings from this study, in alignment with aspects of behavioral economics, provide support for the idea that explicitly stated norms and standards of conduct coupled with a pledge and embedded reminders may be more effective. As another example, instead of one-time, generalized

instruction on responsible conduct of research for new investigators, institutions should consider an alternative approach of ongoing and tailored research training for all researchers, specific to the type of research they conduct. Finally, rather than an annual campaign or one-time event reiterating important aspects of ethical conduct, institutions should provide ongoing communication about specific aspects related to research standards, and celebrate bright spots through award programs and announcements.

Limitations

One obvious limitation of this study is the number of interviews and scope of participant representation, given that all participants work at a single research institution. The participant-group of 20, with the objective of comparing perspectives by different research types (basic and applied), as well research role (administrative leader, professor, associate or assistant professor), provided rich data and revealed themes and trends based on these data; however, it is unknown whether participation by more than one institution would have yielded additional themes or different responses.

Recruiting participants from additional colleges and research disciplines (e.g. engineering, education, public affairs) within the institution could have also strengthened findings in certain areas; however, the intent was to compare perceptions from those who conduct basic and applied research. Selecting two colleges that emphasize of the two broad types of research allowed for analysis of the findings along those lines. Adding participants from other research areas could have made analysis overly complex and made it difficult to distinguish the basic and applied groupings.

The total number of interviews from each college was evenly distributed with ten from each; however, the number of interviews varied by each research role. For example, three department-level leaders were interviewed in the public sciences, and one in the natural sciences. Three associate or assistant professors in the basic sciences were interviewed, and only one interviewee was in this role category in the public sciences. The influence of those uneven distributions on the findings is unknown.

Directions for Future Research

Future research could advance and expand on the findings from this examination. An obvious extension of this work would be to expand the analysis to include perspectives from more research universities in order to move toward more generalizable conclusions. An extension that could yield valuable findings could be the inclusion of universities where a significant, negative, research-related event, such as a scandal, occurred in the last decade, in order to explore more deeply, the approaches taken to sustain or regain trust and confidence among external stakeholders when it may have been compromised.

Another direction to pursue would be perceptions of organizational legitimacy and organizational virtuousness from the vantage point of those who make up the institutional infrastructure that exists to support research-compliance activities at a research university. These are the sponsored-programs personnel, IRB administrators, and other professional staff who make up the institutional office of research. An examination of alignment and misalignment from the vantage point of an institutional

research administrator could offer additional insights. It might facilitate a shift toward institutional approaches that place greater emphasis on actual circumstances that occur in the research environment.

Nearly all participants in my study articulated the perception that there is a lack of understanding among the general public about what research is and is not and what the research process entails. This gap in understanding, coupled with miscommunication, fuels the public's perception of elitism and what is often referred to as the "town-gown divide." Media oversimplification of research and the political climate also has an influence on legitimacy and perceptions of trust, confidence, and meeting societal expectations.

To explore the validity of these perceptions, an examination of the public's perceptions of research could provide further insight about barriers to trust and shifting expectations of the public. It could offer greater awareness about the aspects of organizational legitimacy that research institutions are held accountable to maintain and offer additional insight about ways to engage with the public.

Research on research integrity could benefit from the use of experimental design, like that used in behavioral economics research, to examine rational and irrational behavior and specific approaches to promoting responsible decision making in research. Examples highlighted in my study could be formulated into real-world scenarios to test the actual decision making of researchers when they are presented with a specific situation. Further research is needed to examine whether the small interventions and

social pressures can contribute with as much strength with regard to positive behaviors as they do in the opposite direction.

Conclusion

The research enterprise is a complex, interdependent system that includes universities, scientific societies, federal sponsors, professional associations, journals, and publishers who all play a role in training, employing, educating, sponsoring, and overseeing researcher activity. For three decades, a growing body of evidence has advanced ideas about the causes of misconduct in research, furthering the simple notions that bad decisions come from bad apples and punitive strategies will deter problems. More recent work in this area supports the idea that a complex, multi-faceted approach is needed to address the more ambiguous areas of decision-making in research. Only recently has there been acknowledgement that use, acceptance, and effectiveness of approaches to promote responsible conduct must recognize the needs of researchers and respond to circumstances in the environment where they work. This study articulates the specific perceptions and needs of researchers in order to explore ways of managing integrity that go beyond identification and punishment of bad apples.

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APPENDIX A

University of Minnesota Institutional Review Board Study Confirmation

UNIVERSITY OF MINNESOTA

Twin Cities Campus

Human Research Protection Program
Office of the Vice President for Research

Room 350-2
McNamara Alumni Center
200 Oak Street S.E.
Minneapolis, MN 55455

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NOT HUMAN RESEARCH

March 26, 2019

Melissa Anderson

612-624-5717
mand@umn.edu

Dear Melissa Anderson:

On 3/26/2019, the IRB reviewed the following submission:

Type of Review:	Initial Study
Title of Study:	Institutional Integrity: Perceptions of Organizational Legitimacy and Organizational Virtuousness in a Research University Setting
Investigator:	Melissa Anderson
IRB ID:	STUDY00006012
Sponsored Funding:	None
Grant ID:	None
Internal UMN Funding:	None
Fund Management Outside University:	None
IND, IDE, or HDE:	None
Documents Reviewed with this Submission:	• Slattengren Consent Form, Category: Consent Form; • Slattengren Interview Protocol, Category: Other; • Slattengren, E. - Institutional Integrity, IRB Protocol, Category: IRB Protocol; • Slattengren Recruitment Materials, Category: Recruitment Materials;

The IRB determined that the proposed activity is not research involving human subjects as defined by DHHS and FDA regulations. To arrive at this determination, the IRB used "WORKSHEET: Human Research (HRP-310)." If you have any questions about this determination, please review that Worksheet in the HRPP Toolkit Library and contact the IRB office if needed.

Since the IRB determined this project does not meet the definition of human subjects research, since you aren't collecting private identifiable information about the individuals

themselves personally, you do not need to use the consent form or recruitment materials as submitted. If you want to use similar documents to document permissions, please remove references to IRB review/approval and the subjects advocate line information.

Ongoing IRB review and approval for this activity is not required; however, this determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether IRB review is required, please submit a Modification to the IRB for a determination.

Sincerely,

Jeffery P Perkey, CIP, MLS
IRB Analyst

We value feedback from the research community and would like to hear about your experience. The link below will take you to a brief survey that will take a minute or two to complete. The questions are basic, but your responses will help us better understand what we are doing well and areas that may require improvement. Thank you in advance for completing the survey.

Even if you have provided feedback in the past, we want and welcome your evaluation.

https://umn.qualtrics.com/SE/?SID=SV_5BiYrqPNMJRQSBn

APPENDIX B

Consent Form

Institutional Integrity: Perceptions of Organizational Legitimacy and Organizational Virtuousness in a Research University Setting

You are invited to be in a research study about practices and actions taken to ensure integrity in research at a research university. You were selected as a possible participant because of your role as a researcher or administrator in one of two selected colleges at the University of Minnesota. Please read this form and ask any questions you may have before agreeing to be in the study. This study is being conducted by Erin Slattengren, PhD candidate in Organizational Leadership, Policy, and Development, College of Education and Human Development.

Background Information
The purpose of this study is to explore how actions externally required of the institution relate to the internal culture of the organization in the environment where research takes place.

Procedures
If you agree to be in this study, I would ask you to do the following: participate in an interview of 45-60 minutes. The interview would take place in your office or other setting of your choice, at a time convenient to you. To most accurately capture your responses to questions, the interview session would be audio-taped, with your permission.

Risks and Benefits of being in the Study
There are neither any risks nor any direct benefits to participating in this research study.

Confidentiality:
The records of this study will be kept private. Research records will be stored securely, and my doctoral advisor and I will be the only people with access to the records. Study data will be stored on a password-protected laptop.

Voluntary Nature of the Study:
Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with the University of Minnesota. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

Contacts and Questions:
The researcher conducting this study is Erin Slattengren. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact Erin at

slat0084@umn.edu. or her advisor, Professor Melissa S. Anderson, at 612-624-5717 or mand@umn.edu.