

GETTING TO GREEN: AN EXAMINATION OF THE RELATIONSHIP BETWEEN
INSTITUTIONAL CHARACTERISTICS AND SUSTAINABILITY ACHIEVEMENT AT
FOUR-YEAR U.S.-BASED COLLEGES AND UNIVERSITIES

A DISSERTATION
SUBMITTED TO THE GRADUATE SCHOOL
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE DEGREE
DOCTOR OF EDUCATION

BY

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MUNCIE, INDIANA

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ABSTRACT

DISSERTATION: GETTING TO GREEN: AN EXAMINATION OF THE RELATIONSHIP BETWEEN INSTITUTIONAL CHARACTERISTICS AND SUSTAINABILITY ACHIEVEMENT AT FOUR-YEAR U.S.-BASED COLLEGES AND UNIVERSITIES

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This study presents an examination of how institutional characteristics might influence a four-year institution of higher education's achievement in sustainability, as measured by the Sustainability Tracking, Assessment, and Rating System (STARS). Specifically, it examined the potential role Carnegie classification, sector, location, number of students, and number of tenure-track faculty might play in an institution's Education & Research, Operations, and Planning, Administration, & Engagement scores on the STARS instrument. Multivariate regression analysis and Classification and Regression Tree (CART) modeling were both administered to a data set of 204 U.S.-based four-year institutions. Results suggested that the number of tenure-track faculty did have a significant, positive, influence on an institution's Education & Research and Planning, Administration & Engagement scores. In addition, the CART analysis provided a number of organizational profiles that suggested the types of institutions that achieved significantly higher STARS scores, mainly those considered "liberal arts" and "research intensive". A discussion on the role of faculty members in sustainability planning is provided as well as recommendations for campus sustainability leaders.

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CHAPTER ONE

INTRODUCTION

The history of sustainability in higher education can be traced back to the first Earth Day in 1970 and the emerging environmental movement. Beginning in the 1990's, college campuses began to take notice of each other's actions in addressing their resource consumption, looking to find common ground, and to provide leadership in improving their ecological footprint (Simpson, 2008).

One outgrowth of this common ground was the Talloires Declaration (Universities Leaders for a Sustainable Future, 2001), which has had over 350 signatories in over 40 countries since 1990. This commitment, named for the location in France that initially adopted the document and is now under the leadership of University Leaders for a Sustainable Future, is a "ten-point action plan for incorporating sustainable and environmental literacy in teaching, research, operations and outreach at colleges and universities" (para. 1). To share information and best practices with one another, Yale University started the Campus Earth Summit in 1994 with 160 institutions of higher education represented followed by the bi-annual Greening of the Campus Conference hosted by Ball State University, which continues to the present (Simpson, 2008).

In between these opportunities, colleges and universities began to develop organizations to share ideas and provide support. These include the Campus Ecology Program, supported by the National Wildlife Federation (2013) and the Association for the Advancement of Sustainability in Higher Education (AASHE, 2013a), which had over 890 members by 2013. The most recent development is the American College & University Presidents' Climate Commitment (ACUPCC), which has over 668 signatures as of 2013 (ACUPCC, 2013).

Signatories agree to help their institutions become carbon neutral as soon as possible through regular greenhouse gas inventories, an action plan, and the integration of sustainability into the curriculum (ACUPCC, 2012a).

Providing a definition for *sustainability*, while varied and difficult, mainly describes a specific method of development as defined by the United Nations Brundtland Commission, as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Litten & Terkla, 2007, p. 2). The authors continued that both individual and institutional behavior is key to this development, which within society they called “sustainable progress: a net enhancement in the welfare of individuals, institutions, nations and mankind” (p. 2).

Before exploring sustainability assessment and planning on the college campus, it might be best to define what constitutes a *sustainable campus*. According to Walter Simpson (2008), such a campus would reduce resource consumption, utilize recycled products, reuse and recycle waste, not create pollution, and capture and create renewable energy. Anthony Cortese (2008) argued that the sustainable campus plays a vital role in advancing sustainability in society as a whole through sustainable progress as described above. This is accomplished by placing the human-environment at the center of all academic disciplines, utilizing experiential learning, partnering with local communities and setting an example for students, faculty and staff, the community, and the private sector.

Merkel and Litten (2007) concurred, noting that higher education lies in a unique place to help develop solutions to guide a sustainable society by not just keeping attention on the topic, but by allowing institutions to track and report their progress, thereby setting examples for the private sector, government agencies, and local communities. From the broadest view, this is

accomplished through the measure of an institution's ecological footprint, which helps quantify the impact an institution has on the environment in terms of resource consumption and outputs such as pollution and carbon dioxide. The authors contended that the nature of higher education lent itself to addressing sustainability. This is both because colleges and universities are major consumers of human and natural resources and more importantly because of their mission to teaching, research and service, in addition to any economic and moral benefits which result from embracing sustainable principles.

This argument is continued by Bacow and Moomaw (2007) who pointed to three characteristics of higher education that require institutions to address sustainability: economics, ethics, and mission. First, by reducing pollution and increasing efficiency, institutions address future environmental policies and regulations, and more importantly, better utilize dollars from state legislators, alumni, and student tuition. Second they reason that working towards sustainable progress is ethically "simply the right thing to do" (p. 38). Finally, they believed that lowering the ecological impact of campus operations should be central to the mission of each institution.

Another pair of researchers who examined higher education's contribution to sustainability was Uhl and Anderson (2001) who began discussing universities' roles in sustainability early in the movement. They placed sustainability within five principles: "respecting life and natural processes; living within limits; valuing the local; accounting for full costs; [and] sharing power" (p. 36). They then used Pennsylvania State University as a case study in showing these principles in action on a university campus. These actions steps included lessening dependence on fossil fuels (both in energy production and transportation), water and land conservation, reducing waste, eating sustainably produced food; embracing green building,

and creating space in the curriculum to teach, and research, sustainability. This final point includes ensuring students were aware of how ecosystems function, making connections in the lifecycles of materials, and understanding their ecological footprints. All of these activities and principles shared a common goal: creating responsible citizens. Measuring this change however, is difficult, as definitions can be vague and metrics hard to identify.

In attempting to detail metrics for measuring sustainability on campus, Thompson and Creighton (2007) also provided a case for higher education's role in sustainable progress and development. They, like Bacow and Moomaw (2007), pointed to the support of the mission of the institution. In addition, they believed that sustainability complements academics, can link environmental performance to institutional goals, raise awareness of resource consumption, and mobilize faculty, staff, and students to address ecological impacts not just on campus, but in their personal lives as well. They also addressed the diverse stakeholders that are interested in the sustainability performance of campus, including regulators, donors, alumni, government policy makers, professional organizations, and ranking groups, not to mention on-campus audiences.

White (2009) demonstrated that this emerging concentration in higher education involves participation from all types of institutions, not just research universities with large budgets or private liberal arts colleges with more academic and financial freedom. To do this, she compared the 379 charter members of the ACUPCC by size, location, and type within the larger context of organization change and learning. She found no typical characterization of a charter institution pledging to become carbon neutral. This showed an innovation that has few barriers to being integrated on any campus, because there is so much variety in how to best address sustainability in campus operations, in the classroom, and in the administration building.

Statement of Problem

With so many institutions looking to measure, track, and plan their sustainability efforts, there is little guidance available in how best to maximize the current assessment tools available. Attempts to quantify sustainability efforts in higher education over the past decade have mainly been relegated to rankings established by mass media outlets or only examined specific areas, such as dining, campus buildings, or carbon output. A recent effort by sustainability professionals aims to allow institutions to self-report their actions across campus areas. This instrument allows sustainability coordinators, committees, or directors to essentially take stock of how sustainability is integrated across their campus within one survey. In essence, this then allows institutions to compare “apples to apples,” comparing their efforts and identifying emerging trends in campus sustainability. As such, the results from the survey create institutional benchmarks and peer comparisons that can then be used for additional study and planning.

Purpose of Study

The purpose of this study is to analyze the relationship institutional characteristics have on the attainment of sustainability outcomes as self-reported in the STARS (Sustainability Tracking, Assessment, and Ranking System) survey, administered by AASHE. Specifically, the study will examine the impact institutional characteristics (i.e., sector, Carnegie classification, campus setting, FTE enrollment, and number of tenured/tenure track faculty) have on an institution’s sustainability score, including education/research, operations, and planning/administration/ engagement (and affiliated subcategories) across 200+ institutions. Hence, this study will utilize continuous, secondary, data. A multivariate regression analysis

will be employed to identify the impact of the above-mentioned institutional characteristics on institutional efforts to achieve maximum sustainability.

Assumptions

The project makes a few assumptions that should be addressed from the onset. The first is that the results of this study are based on the information provided by institutions that have made a commitment towards sustainability. As such, they should not be attributed to higher education as a whole. While the number of institutions focusing on institutional sustainability is growing, it is not a trait or focus of every institution.

Second, this project assumes that the responses to the STARS survey are complete and accurate. STARS surveys are institutionally completed and are not verified by the AASHE, unless another institution believes the responses to be inaccurate. In some institutions, STARS surveys are completed by an individual, at other institutions they are completed by committees consisting of individuals responsible for each area of the survey. Assuming the accuracy of information will need to be an acceptable risk.

Finally, this study makes many of the common assumptions intrinsic to quantitative research. The aim of this study is make generalizable results, based on survey responses on institutional sustainability. As such, it believes that sustainability metrics are tangible, objective, and are measurable. It also assumes that any causality shown in the findings is traceable and attributed, at least partially, to the relationship between the variables.

Outcome

The outcome of this study will be the construction of a prediction model demonstrating the effect of demographic characteristics on each sustainability category. In addition, this study will create organizational profiles of those participating institutions with higher than average

STARS scores. The results of this study will therefore allow institutions to measure the impact their demographical characteristics have on sustainability efforts as well as organizational profiles of the most successful institutions, in terms of sustainability efforts. In turn, these outputs can have a direct effect on how campus sustainability leaders approach sustainability planning at their individual institutions.

Research Question

As this is mainly exploratory research, this study addresses only one research question: Do institutional characteristics suggest a relationship to the attainment of sustainability within participants of the Sustainability Tracking, Assessment, and Rating System (STARS), specifically those four-year institutions of higher education in the United States?

Hypothesis

There will be a statistically significant relationship between institutional characteristics and that institution's sustainability score.

Significance

The significance of this project lies in its ability to assist institutional leaders (Presidents, Provosts, Sustainability Directors, etc.) to utilize the current assessments they participate in (mainly STARS) to influence how they plan future sustainability initiatives and set benchmarks for success. Specifically, it will help administrators plan more strategically, based on their institutional characteristics and the suggested relationships between those characteristics and their sustainability potential. For example, a Midwestern, rural, public institution might have a good deal of potential in improving administratively led initiatives such as planning and operations, but improving their education score is more difficult than institutions with a different set of characteristics. As such, a sustainability plan could have larger increases in renewable

energy production, while making smaller steps in the student-focused areas, and the institution still feel it is making progress in addressing sustainability. In addition, as more institutions join the sustainability movement, they will be able to set initial planning metrics based on the experiences of the peers using STARS.

Summary

In summary, sustainability has become a major initiative at many colleges and universities. Each institution may individually approach how to best integrate its tenants into organizational culture and decision-making, however the assessment tools available are common between institutions. This not just allows for comparisons *between* institutions, but allows for generalizations to be made about similarities *among* institutions. Given the increasing importance of sustainability assessment, reporting, and planning, this study aims to assist administrators in utilizing their own assessment activities to support their campus sustainability planning, based in part on the potential advantages and limitations presented by their institutional characteristics.

CHAPTER TWO

LITERATURE REVIEW

Project Summary

The intent of this study is to analyze the potential relationship institutional characteristics have on the attainment of sustainability outcomes as self-reported in the Sustainability Tracking, Assessment, and Rating System (STARS) survey, administered by the Association for the Advancement of Sustainability in Higher Education (AASHE). Specifically, the study will examine the potential impact of institutional characteristics, including sector, Carnegie classification, campus setting, FTE enrollment, and number of tenured/tenure track faculty on an institution's score of sustainability, including education/research, operations, and planning/administration/engagement (and affiliated subcategories) across 200+ institutions.

This review of literature discusses the planning process for sustainability in higher education institutions and the role that assessment plays in informing and directing that planning. In addition, it reviews the current assessment tools currently available for institutions to both measure their sustainability efforts and to compare with other institutions. By understanding the importance assessment plays in the sustainability planning process, we can begin to see how understanding individual institutional demographics could impact the direction of sustainability planning.

Sustainability Planning

While sustainability touches a number of areas on college campuses, from student life, to facilities, to curriculum, it is only in the past decade that it has undergone a shift to becoming a true institutional movement. As noted by Ben Eisen (2009), the most prominent sign of this shift was the inclusion of sustainability metrics into institutional strategic plans; in some cases,

sustainability is even the focus of stand-alone institutional plans to be used in conjunction with a master strategic plan. Eisen demonstrated this by showing the variety of institutions creating sustainability plans, from the College of the Atlantic to the University of California's Berkley campus. In addition, Terry Calhoun of the Society of College and University Planning made a strong connection between long-term sustainability initiatives and planning saying,

Without connection and integration with a master plan or the strategic plan, any efforts will have a hard time holding their own, especially when budget time comes along . . . If you did good integrated planning, you would end up with sustainability. Why would build a building that uses six times as much energy as it has to? (Eagan, Calhoun, Schott, & Dayananda, 2008, para. 5)

What makes an institutional or strategic plan one that embraces sustainability? To Waite (2003), sustainable planning must be "simultaneously ecologically possible, economically gainful, and ethnologically adoptable" (p. 82). The benefit of using such a definition, Waite noted, is that while no policy or plan is universal, the definition allows for flexibility in the planning process among and between institutions. In other words, institutions have a variety of options in developing sustainability plans that all address the same overarching goals.

Many institutions have already undertaken sustainability planning as part of their commitment to meet their requirements of becoming signatories of the American College and University Presidents Climate Commitment (ACUPCC, 2013). To date, 673 institutions have signed onto this commitment to work towards climate neutrality on their campuses, where any energy used will be balanced either through renewable resources or mitigation through other financial methods, such as carbon offsets. Of those 673 institutions, 516 have submitted climate action plans, assessing their institution's progress in addressing seven related actions, including:

- having a building policy that all new construction meets LEED Silver standard from the U.S. Green Building Council;
- a purchasing policy that all new appliances meet ENERGY STAR certification;
- a travel policy that all greenhouse gas emissions will be paid by the institution;
- public transportation access provided to all faculty, staff, students, and visitors;
- will ensure within one year of submission of the action plan that 15% of electricity consumption will come from renewable resources;
- will also ensure the institution's endowment supports shareholder proposals that support climate and sustainability-focused investments; and
- will reduce waste through participation in RecycleMania and additional measures (ACUPCC, 2012b).

The importance sustainability planning can have on the institution should not be underestimated. Bernheim (2003) noted that sustainability planning is something that should be seamlessly tied into any other institutional-level planning process, and as such, integrated into the institution's planning goals, measurements, and decision making. It is his belief that in order for an institution to have an effective curriculum that emphasizes sustainability, an institution must first have a strong planning policy that embraces sustainability. He pointed to the LEED rating system as a framework for institutions to begin facilities planning, including energy conservation, efficiency, and quality.

Indeed the impact of planning decisions regarding sustainability on student learning is quite evident in the literature. Haigh (2005) argued that an institution's commitment to demonstrate the principles of sustainability "cannot be restricted to the environmental disciplines . . . but must be demonstrated by the whole of an HEI's approach to the world" (p. 31). To that

end he noted, “sustainability should be central to concerns both in HEI curricula and in operational practice” (p. 31).

Pagini (2008) described the operational decisions made by an institution as a “legacy” (p. 50) and as such, campus planners should be tasked with ensuring that students are not just proud of their campuses, but learn from them and in turn apply those lessons to their lives well after graduation. To demonstrate this, Pagini described a course in which he included a detailed campus tour describing those aspects related to sustainable practices that the institution had installed. Pre and post-surveys were given to students on their knowledge of green building practices, awareness on how buildings influenced the environment, perceptions of the institution’s commitment to sustainability, and personal behaviors related to sustainability. The surveys showed that a campus tour and lecture on the sustainable practices instituted by their school significantly increased each area, including their knowledge of green buildings and positive behaviors towards integrating sustainable practices into their personal lives.

One institution that has explicitly made the connection between integrating sustainability into curriculum and campus planning is Carlton College at the University of Minnesota. Savanick, Strong, and Manning (2008) analyzed the effect this connection has had on students, faculty, and facilities personnel, especially in the installation of a campus wind turbine, construction of an ecologically-friendly campus house, creation of a green roof, and restoration of a campus wetland. The case studies of each project demonstrated a mutually beneficial experience for students, faculty, and facilities personnel. Specifically, students were able to share their knowledge of green building practices with the facilities areas, while at the same time changing those employees’ attitudes towards sustainability projects on campus. In addition, students were able to connect these projects to additional coursework, generated ideas for

additional campus projects, and reported more positive behavior as related to sustainability living principles.

Guides

Given the increasing importance of sustainability planning within higher education administration, a number of sustainability-focused organizations have created guides to assist individuals throughout the process. Taken together, these documents demonstrate the importance of assessment as part of the planning process.

In general, a major preliminary step in sustainability planning is bringing together leadership and undertaking an assessment in what the institution has already accomplished and what potential goals the institution might have. The National Wildlife Federation's guide (Eagan et al., 2008) suggested utilizing SWOT (strengths, weaknesses, opportunities and threats) analyses to identify strengths and weaknesses, decide which weaknesses should be strengthened or forgotten, how to best manipulate identified opportunities, and how to defend against realized and potential threats. What was missing from their report, however, was how to best assess (and even quantify) a holistic picture of sustainability initiatives, especially outside of energy usage and transportation. Assessing curriculum offerings (current and potential), student support, research engagement, and endowment strategies, among other areas that were not included in the planning process, were all aspects of sustainability planning missing from their guide.

A guide from the U.S. Green Building Council (USGBC; Humblet, Owens, & Roy, 2010) took sustainability planning a step further by working to completely include the campus environment, in and out of the classroom. Their first step towards creating a green campus was an assessment of campus-wide activities and resources. Beyond a review of energy usage, the

USGBC recommended identifying course offerings and existing policies and plans. This guide, however, continued to primarily focus on the built campus environment.

The built environment continued to be the emphasis in the other two main sustainability–planning guides available to administrators. AASHE’s guide focused on climate action planning and did not address how to include and assess other campus activities or the integration of climate plans into the university curriculum (Simpson, 2013). In addition, connections to student life, teaching, or research impacts on sustainability were not discussed. The guide from the Rocky Mountain Institute (Kinsley & DeLeon, 2009) did include faculty and staff engagement in terms of putting together an oversight committee for the plan, but further assessment of activities on campus was not included; the focus was on climate mitigation, and as such, these guides concentrated on energy and transportation over curriculum, activities, or research. What these four guides have demonstrated is that within the higher education sustainability movement, the emphasis in available materials to assist administrators and sustainability professionals in planning lies in what is easiest to measure and easiest to visibly change, mainly the build environment.

Two institutions that have become exemplary models of the sustainability planning process are the University of Vermont and University of New Hampshire. The University of Vermont (Pollock, Horn, Costanza, & Sayre, 2009) was recognized for its consensus-building model in developing a sustainability charter and action plan. In relation to this study, it is important to note that education and research were major foci of their campus-wide assessment. Survey variables included: cross-discipline degrees, service learning, technology literacy, distance education, place-based education, student evaluation, agriculture courses, and collaboration between research and education. By having almost one-half of assessment

variables focused on education and research, the institution was able to work to measure its previous activities and to then plan on how to better incorporate sustainability into academic affairs.

The University of New Hampshire's process (Cleaves, Pasinella, Andrews, & Wake, 2009) concentrated much more on addressing carbon reduction through energy conservation and non-renewable sources. That said, the assessment tool that was created for their campus did include integration into curriculum, research, and community engagement. Their plan involved utilizing a campus-wide Energy Task Force to decide how to best combine the ultimate goal of greenhouse gas reduction with the institution's educational mission.

These two institutions demonstrated how the practical goals of resource reduction and sustainability education through climate action planning could be partnered with the institution's educational mission, which would broaden the outreach to include curriculum, research, and student involvement. Better utilization of available assessment tools can further this type of planning.

Sustainability Assessment

There is no question that assessment has become standard fare in higher education, measuring anything remotely quantifiable, and campus sustainability is no exception. A survey by the Association of American Colleges and Universities (Jaschik, 2009) found that 78 percent of institutions have defined outcomes for undergraduate education and that 72 percent assess quantifiable outcomes within specific curricula. This demonstrates that the identification of measurable criteria is vital to the planning process in higher education.

More specifically, Ndoye and Parker (2010) found in a survey of higher education planning professionals that leadership, faculty development, resources, student participation, and

data usage were most important in helping institutions create a “culture of assessment” (p. 36). They also found in regards to sustainability on campuses, that those respondents who felt their institution was making significant strides emphasized change (both culturally and environmentally), development assessment tools to capture data, and regularly communicated with campus constituents.

Shriberg (2002) discussed the importance of cross-institutional sustainability assessment tools, regardless of assessment theory. To him, they allowed not just for measurements related to institutional commitments, but to assist in planning that resulted in actual changes that could be tracked longitudinally and compared between institutions. This way, while each system might have its own strengths and weaknesses, by encompassing all campus activities and operations related to sustainability, these cross-institutional assessments result in net positive change.

Assessment also plays an important role in assisting an institution’s capacity for sustainability achievement. In examining the factors that made three Minnesota institutions highly recognized by the National Wildlife Federation’s Climate Ecology Program, James and Card (2012) found assessment to be one of the six key factors in sustainability achievement, in addition to operations, administration, teaching/research/service, activism, and acceptance to change. Specifically, the study cited all three institutions participation in STARS as key to monitoring and assessing their progress towards becoming more sustainable.

In an early analysis of sustainability reporting in higher education, Lozano (2010) reviewed the sustainability reports from 12 institutions that utilized the Graphical Assessment of Sustainability in Universities (GASU) tool, a UK-based assessment instrument. As noted by the author, sustainability reporting presented these institutions with an opportunity to “assess their current state in regards to economic, environmental, social, and educational dimensions. It also

helps to communicate such efforts to their stakeholders” (p. 74). At the time of publication, sustainability reporting was in its infancy, and while the results were essentially inconclusive, the author noted the potential for widespread assessment, reporting, and influence on administration of sustainability initiatives.

A similar study of the 25 largest Canadian institutions using the Global Reporting Initiative (Fonseca, Macdonald, Dandy, & Valenti, 2010), demonstrated that sustainability reporting was “an uncommon and diverse practice [that] generally had limited scopes emphasizing eco-efficiency” (p. 22). Of the institutions surveyed, only seven had initiated sustainability reporting prior to 2008. Even given the limited scope and use of the study, the authors discussed the potential to university administrators to not just assess their current efforts to discover their potential but to develop plans to see that potential reached.

In a review of sustainability-focused academic programs at nine diverse institutions of higher education, Grecho (2008) identified five categories that could be used in assessing sustainability progress, including:

- how sustainability enhanced academic programs,
- how the curriculum related to sustainability,
- the identification of hands-on learning activities,
- the engagement of local communities in sustainability, and
- the institution’s commitment to sustainability.

Grecho undertook this assessment in light of the concentration of previous efforts at the institutional level that have only concentration on environmental conservation, demonstrating that assessments focused on facilities performance needed to also include academic indicators as well.

Current Ranking and Ratings Systems

Oberlin College's David Orr (2008) wrote on the difficulty ranking organizations face when examining sustainability in higher education. He especially noted the struggle in defining evaluation criteria; let alone how to rank those identified criteria. He suggested those interested in ranking efforts examine consumption rates per student, facilities management policies, ecological literacy within the curriculum, and institutional policies in regards to sustainability.

Beginning around 2008, outside organizations began taking an interest in assessing sustainability at colleges and universities across the US. This is demonstrated by articles in outlets such as the *The Chronicle of Higher Education* (Carlson, 2008a), *The New York Times* (Galbraith, 2009), and the journal *Nature* (Mascarelli, 2009). Each of these authors discussed the increased interest by administrators, faculty, students, alumni, policy makers, and the general public in the efforts institutions were making in addressing sustainability, both in the classroom and in the built environment on campus. Specifically, they mentioned a number of the ranking and ratings systems available in higher education at the time: the Sierra Club, the Princeton Review, the Sustainable Endowments Institute, and the Sustainable Tracking and Reporting System (STARS), created by AASHE.

Sierra Club

The Sierra Club's "Cool Schools" list (2012) is an annual survey and research project undertaken by the publication that reviews colleges and universities on ten areas: green building, energy supply, food, curriculum, purchasing policies, transportation, waste management, investment priorities, student activism, and administration commitment. Some of these criteria are reported directly by institutions, such as energy efficiency and purchasing policies, while others come from student interviews by Sierra, and scores given directly by Sierra Club

researchers (Carlson, 2008b). Because portions of the assessment are quite subjective, scores and rankings vary from year to year, with some institutions going from third on the list, to off the list, only to return the following year. This confusion does not allow for apples-to-apples comparisons or longitudinal tracking for institutions, while the shifting methodologies hinder an institution's ability to use the surveys for planning purposes.

LEED

The Leadership in Energy and Environmental Design (LEED) certification designed by the United States Green Building Council (USGBC, 2013) certifies sustainable buildings, both residential and commercial. The certification measures a number of areas related to sustainability, including:

- the building site,
- water efficiency,
- energy usage and impact on local air quality,
- materials used,
- indoor environmental quality,
- location and community linkages,
- public awareness and education, and
- innovation in design.

While these ratings are not meant for comparison of institutions, they have been used in studies to assess how institutions of higher education use the LEED system to assist in facilities and sustainability planning. Chance (2010) looked at patterns in LEED ratings across a sample of 181 LEED-certified buildings and her results suggested increased planning and organizational leadership in sustainability. Multiple regression analysis showed that the Energy and

Atmosphere, and Sustainable Sites categories were the two top variables that influenced a building's rating and could predict a building's rating. These results suggested that administrators ensured that their building plans emphasized the maximum efforts in those two areas to achieve a maximum building rating. With the LEED system, administrators have demonstrated purposefully planning, in part, to achieve a desired ranking directly related to the environmental impact of their facilities.

Sustainable Endowments Institute

The Sustainable Endowments Institute (SEI, 2012) created the Green Report Card to evaluate campuses in a number of dimensions of sustainability, including administration, climate change and energy, food and recycling, green building, student involvement, transportation, endowment transparency, investment priorities, and shareholder engagement. Four surveys covering different campus areas were sent to various officials at each institution whom had oversight in that specific topic: in 2011, 52 institutions out of 322 surveyed shared the highest grade of "A-." Their online database allowed researchers to compare institutions, within the given year, by a number of categories, which could assist campus leaders in comparing their institution against their peers as well as in finding new ideas and resources.

Major limitations of this resource were that surveys were only sent to institutions with large endowments (\$160 million or greater) and institutions who did not meet the endowment minimum, but wished to participate, were required to pay a \$700 fee which left many smaller institutions out of the survey. In addition, the methodologies changed from year-to-year, making comparisons quite difficult.

In 2012, SEI decided to suspend their Green Report Card to concentrate on other sustainability initiatives in higher education. In a 2012 article for *The Chronicle of Higher*

Education, Scott Carlson noted sustainability professionals “had long complained about the report card . . . and the administrators questioned the methodology behind them” (para. 5). It was these frustrations with external sustainability assessment tools that led the profession to create their own system.

Sustainability Tracking, Assessment & Rating System (STARS)

The STARS system, created by the Association for the Advancement of Sustainability in Higher Education (AASHE), and discussed further in Chapter 3, is a self-reported assessment tool that aims to address the concerns of previous sustainability assessment instruments. The goals of the STARS are to:

1. provide a framework for understanding sustainability in all sectors of higher education,
2. Enable meaningful comparisons over time and across institutions using a common set of measurements developed with broad participation from the campus sustainability community,
3. Create incentives for continual improvement toward sustainability,
4. Facilitate information sharing about higher education sustainability practices and performance, and
5. Build a stronger, more diverse campus sustainability community. (AASHE, 2012a, para. 2)

The tool is available to any college or university, including professional schools, and is meant to be utilized to assist in institutional assessment and planning, including those institutions just beginning to address sustainability on their campus and looking to create baseline measurements. Ratings, which are good for a three-year period are based on the score given from the assessment and include levels of Bronze, Silver, Gold, and Platinum, as well as a “Reporter” status for institutions that choose to not make their scores publicly known.

Given the relatively recent emergence of STARS as a campus sustainability assessment tool, only a few studies have been conducted on either the dataset or the experience of undertaking such an assessment. Hession (2011), in a qualitative study, described the experiences of nine institutions in the northeast who participated in the full pilot of the STARS program and found few distinguishing characteristics between each institution's experience and that while some found it difficult to complete the required information within the specified timeline, each institution found it to be a worthwhile experience.

One example of an institution that utilized the sustainability assessment metrics provided by STARS for institutional planning purposes is the University of Maryland College Park (DeLeon, 2011), whose Office of Sustainability employs a full-time Sustainability Measurement Coordinator. By producing an annual *Sustainability Metrics Report*, the institution has been able to use this data to aid the University Sustainability Council in developing plans, goals, and objectives, both short and long-term, in addition to informing campus stakeholders.

Summary

This chapter has shown the increasing importance of assessment and planning of sustainability in higher education. While planning and assessment are becoming increasingly important to sustainability professionals to measure their progress and plan for the future, the guides and instruments available are often incomplete. While the emergence and acceptance of STARS as the premier sustainability measuring tool is assisting in improving these efforts (Carlson, 2012), they still only allow for a current snapshot and offer little insight into potential growth, which is especially important for institutions working to meet their common goals of carbon neutrality and integrating sustainability into the classroom.

This study, along the lines of the Chance (2010) study, aims to provide direction for potential growth in sustainability for an institution by assisting to identify which sustainability metrics institutions have the greatest potential for growth as well as which are influenced by their own institutional characteristics. In summary, given that little research has been conducted on the STARS dataset and STARS has the potential to assist in sustainability measurement and planning, a good first step is to analyze potential impacts of institutional characteristics on an institution's sustainability initiatives.

CHAPTER THREE

METHODOLOGY

Project Summary

Just as with student learning outcomes and the freshman experience, institutions of higher education are looking for ways to measure their commitment to sustainability. This occurs across multiple venues on the campus: in the classroom, dormitories, dining halls, and facilities areas, as well as within the curriculum and planning by the administration. While a number of assessment tools have been created to measure aspects of campus sustainability, the Sustainability Tracking, Assessment, and Rating System (STARS) assessment tool has risen to the top as the most accepted by sustainability professionals. This study aimed to assess the relationship institutional characteristics has on the attainment of sustainability outcomes within in the STARS survey.

Design of the Study

Statement of Purpose and Research Question

As efforts to quantify sustainability efforts in higher education over the past decade have been mainly relegated to rankings established by mass media outlets or only examine specific areas, such as dining or carbon output, the purpose of this study is to analyze the relationship institutional characteristics have on the attainment of sustainability outcomes as reported in the STARS survey, administered by the Association for the Advancement of Sustainability in Higher Education (AASHE). Specifically, the study will examine the impact of institutional characteristics (sector, Carnegie classification, campus setting, FTE (full-time equivalency) enrollment, and number of tenured/tenure track faculty) on an institution's score of sustainability (education/research, operations, and planning/administration/engagement). Specifically, the

research question asks: Do institutional characteristics suggest a relationship to the attainment of sustainability within four-year higher educational institutions in the United States?

The outcome of this study will be the construction of a predictive model demonstrating the effect of each demographic characteristic on each sustainability category, as well as organization profiles of the most successful STARS participants, in terms of rating. The results of this study will therefore allow institutions to measure the impact their demographical characteristics have on sustainability efforts. In turn, this can have a direct effect on how campus sustainability leaders approach sustainability planning on their individual campuses.

Hypothesis

Given the lack of research utilizing the STARS dataset and in sustainability attainment within higher education in general, it is difficult to create a formal hypothesis for the relationship between individual variables, only that a statistically significant relationship exists between institutional characteristics and attainment in sustainability, as measured by STARS.

Population and Sample

As of December 2013, 204 U.S.-based, four-year, institutions have participated in the STARS program, submitted reports, and received a ranking (AASHE, 2013b). Given the relatively small number of participants and the geographic breadth of the study, results from all participants (i.e., the entire population) will be analyzed. In addition, the population size exceeds the recommended sample size for this population ($n = \sim 80$), as suggested by Krejcie and Morgan (1970).

Research Method

In applying the scientific method to educational research, the researcher aims “to explain, predict, and/or control educational phenomena” (Gay, Mills, & Airasian, 2006, p. 5). There are

two commonly accepted streams of research methodology: quantitative and qualitative. Both methods are equally utilized in higher education research, often when examining the same topical areas. In examining the influence of institutional characteristics on various outputs, quantitative data is the most utilized.

As defined by Creswell (2003), in quantitative research:

The investigator primarily uses postpositivist claims for developing knowledge (i.e., cause and effecting thinking, reduction to specific variables and hypotheses and questions, use of measurement and observation, and the test of theories), employs strategies of inquiry such as experiments and surveys, and collects data on predetermined instruments that yield statistical data. (p. 18)

As such, a study investigating sustainability in higher education, as defined by Creswell, could utilize various data points related to sustainability measures and institutional characteristics, to examine how the variable might be related to bring about new knowledge on the topic.

Data Collection Procedures

Data being analyzed for this project comes from existing, secondary, sources. These instruments are currently recognized as the most appropriate for describing institutional characteristics and assessing sustainability progress. Descriptions of each instrument follow below.

STARS

As introduced in Chapter Two, the Sustainability Tracking, Assessment, and Reporting System (STARS) has been created by the Association for the Advancement of Sustainability in Higher Education (AASHE), to provide a thorough assessment of sustainability initiatives on college and university campuses (2012b). Initiated in 2006 and developed over a two-year

period, STARS underwent two drafts (0.4 & 0.5) as well as a full pilot with volunteer institutions, before being launched in 2009. Currently, over 254 institutions are participants in the STARS program (AASHE, 2013b), however 204 four-year, U.S.-based institutions have submitted an annual report and received a ranking during the course of the program.

The administration of STARS (AASHE, 2012c) is handled by AASHE, however the survey is guided by a Steering Committee of campus delegates representing various areas of campus sustainability, members of AASHE's Board of Directors, and AASHE staff. In addition, groups of Technical Advisors serve under each STARS survey area to assist in improving survey questions and scoring, as well as address questions raised by participating institutions.

While there are not traditional measures of reliability associated with STARS scores, to ensure report accuracy, institutions must assign each criterion a Responsible Party, submit a letter from the institution's president/chancellor stating all responses are truthful, and ensure that all institutional responses for rated colleges and universities are made publicly available.

AASHE also has created a "STARS Data Accuracy Policy" (2013c) to describe how report accuracy is insured, publication review, and how to make inquiries should an individual question the accuracy of an institution's response. Use of STARS data in research projects is allowed by AASHE, through their "Data Use Guidelines" document (2013d).

STARS institutions are scored under three categories: Education and Research; Operations; and Planning, Administration and Engagement. These broad category headings will be the levels analyzed for this study, with all U.S.-based, four-year, participating institutions being considered. Below each category are subcategories that consist of individual criteria, worth up to two points depending on the weight (importance) of that criterion (AASHE, 2011). This allows for institutions to essentially skip those individual criteria that are not applicable to

specific institutions (such as those without dining halls or food service). Institutions also have the option to not answer a question, however, this counts against their score as a “0”. Each score is presented as a percentage of individual scores against total points possible, totaling 100 points per category.

IPEDS

The main source of institutional characteristics will be drawn from the Integrated Postsecondary Education Data System (IPEDS), maintained by the National Center for Education Statistics at the U.S. Department of Education’s (2012) Institute of Education Sciences. IPEDS data is submitted by all institutions that receive federal student financial aid, pursuant to Title IV of the Higher Education Act of 1965. For this study, the following variables will be pulled from IPEDS for those U.S.-based, four-year, institutions that have completed the STARS survey (see Table 1 for definitions of each variable).

- Sector: Given the potential role of state legislators in influencing institutional decision-making in sustainability, the type of institution could prove significant in how an institutional approaches decision-making in relationship to sustainability. In addition, whether an institution is public or private has proven an influence characteristic in studies including institutional expenditures (Weerts & Ronca, 2006) and student development (Reason, Terenzini, & Domingo, 2006).
- Carnegie classification: Recent qualitative studies in higher education have demonstrated the influence of an institution’s Carnegie classification on areas ranging from decision making (Favero, 2006) to faculty productivity (Santo, Engstrom, Reetz, Schweinle, & Reed, 2009).

Table 1

IPEDS Variable Names & Definitions

Variable Name	Definition
Sector of Institution	Specific to this study, only two of the nine institutional categories were used: “Private, 4 year or above” and “Public, 4 year or above”.
Total Fall FTE student enrollment	Early estimates of full-time equivalent enrollments from Fall 2012 were used, including both graduate and undergraduate enrollment, using the formula derived by the U.S. Department of Education.
Carnegie Classification	Institutional classification as stated by the Carnegie Foundation. Options included: Baccalaureate Colleges (Arts & Sciences or Diverse Programs); Master’s Colleges & Universities (small, medium, or large programs); Doctoral/Research Universities; Research Universities (high or very high research); and Schools of Business & Management.
Setting	Denotes the geographical setting of the campus. Options include: City (large, midsize, or small); Suburb (large, midsize, or small); Town (distant, fringe, or remote); or Rural (distant or fringe).
All Tenured/Tenure-Track Faculty	Includes the number of fully tenured or tenure-track faculty at the institution as of Fall 2012.

- Campus setting: Given the emphasis on the student role in sustainability, as documented within the STARS survey, this variable holds potential, and has been utilized in studies related to student engagement (Strayhorn & DeVita, 2010) and college transition (Inkelas, Daver, Vogt, Leonard, 2007).
- Enrollment: Previous studies have suggested that the enrollment of an institution has shown significance in areas ranging from institutional expenditures (Gansemer-Topf & Schuh, 2006) to student engagement (Porter, 2006).
- Number of tenured/tenure track faculty: The STARS survey is interested in the proportion of faculty participating in sustainability research and education. That variable has also proven important in studies including similar areas, such as strategic planning (Welsh, Nunez, & Petrosko, 2006).

Use of multivariate analysis in higher education research utilizing IPEDS data is not novel. Fife and Losco (2004) compared the recently revised Carnegie institutional categories using IPEDS data and institutional expenditures designated for the purposes of research, instruction, and public service. By analyzing three models for doctoral extensive, doctoral intensive, and Master's I institutions, respectively, they were able to address distinctions between institutional characteristics of each model – mainly related to research expenditures.

Similarly Cragg (2009) used multivariate analysis, mainly logistic regression, to build a probability model for graduation rates, based on student and institutional characteristics, utilizing two national datasets, including IPEDS. Much like the goal of this study aims to connect sustainability achievement to institutional characteristics, Cragg examined the relationship between student achievement (in the form of graduation) as evidenced by student responses on the Beginning Postsecondary Study survey, as well as institutional characteristics. As a result,

she identified that personal interaction with faculty and participation in extra-curricular activities increased the probability of graduation, regardless of institution type.

Finally, Volkwein and Sweitzer (2006) examined *U.S. News & World Report* scores utilizing institutional characteristics from IPEDS, as well from the mass-published college guidebook. Using a multivariate (robust) regression model, the researchers were able to explain 90% of the difference between institutional scores for both research and baccalaureate institutions, which demonstrated the significant role faculty salaries, enrollments (compared to peer groups), and admissions statistics play in this important prestige publication.

Statistical Design and Analysis

A dataset will be created of each institution's respective STARS scores and institutional demographics. The dataset will be created in Microsoft Excel and then imported into R, a free software program for statistical analysis. Both descriptive and inferential statistics will be analyzed, including measures of central tendency and, of most importance for this study; multivariate regression and Categorical and Regression Tree (CART) analyses will be utilized to create both a prediction model and organizational profiles (Burbach, Cnaan, & Babbitt, 2010).

Multiple regression analysis, and specifically multivariate regression, has been utilized a number of times in higher education research. Previous studies have examined student learning outcomes (Yamarick, 2007), academic cheating (Robinson, Amburgey, Swank, & Faulkner, 2004), and course satisfaction (Betoret, 2007). Based on these studies, and the emphasis on the creation of a prediction model, as opposed to only examining differences between variables, multivariate regression is the most appropriate analysis for this specific study.

Tables, including coefficients, t statistics, p values (the level of statistical significance), and the adjusted R squared (how closely the included variables describe the model), will be included for each dependent and independent variable.

In addition to the multivariate regression analysis, the data will also be organized into classification and regression trees, more commonly known as a CART analysis. A CART analysis takes all available variables and data points and runs them through every potential permutation, looking for which appropriate combination of variables create a significant mean score (Breiman, Friedman, Olshen, & Stone, 1984). For this study, each dependent variable will have a separate CART analysis.

As summarized by Lewis (2000), “CART analysis is a tree-building technique which is unlike traditional data analysis methods” (p. 2). CART is a relatively new statistical method that has only come into general use thanks to robust computer programs that can handle the mathematics involved to determine significant predictor variables. Because it is non-parametric, and has no assumptions usually attributed to quantitative methods, it is very useful in exploratory research. As such, it will be a helpful companion to the regression analysis.

The output will result in a “tree” in which a pathway of “nodes,” which suggests those variables (and at what level) play a significant role. The end result, or “terminal node,” is the average mean score for that dependent variable based on the characteristics of the variables that precede it. This analysis will be processed in the Rpart package with the R statistical package (Therneau & Atkinson, 2007). The output of the CART analysis will supplement the multivariate regression analysis by providing a more detailed picture of specific organization profile beyond simply which variables produce significant results for the full regression model.

CART analysis has been utilized in a number of disciplines, including education. Specifically in higher education studies, Weerts and Ronca (2009) utilized CART to predict which characteristics influence alumni giving at colleges and universities. In addition, Lampropoulos, Schneider, and Spengler (2009), applied CART analysis to suggest which variables caused participants to drop out of university counseling training clinics.

Summary

As described above, this study will utilize quantitative methods to address the research question of identifying the significant institutional characteristics related to an institution's sustainability score as described in the STARS survey. With the prediction model, as described, an institution would be able to input their specific characteristics and have an anticipated expectation, based on their peers, of their potential in attaining sustainability, as described within the STARS survey. This would aid not just in establishing benchmarks based on a peer's performance, but also have the potential to impact campus planning, as it relates to sustainability. In addition, the CART analysis could provide ideal institutional characteristics to produce the highest score on a given STARS category.

CHAPTER FOUR

RESULTS

Project Summary

Given the increased interest in higher education in addressing and improving an institution's sustainability efforts, a number of guides, surveys, and assessments have surfaced to assist institutions in measuring their efforts. This study specifically examined the potential impact of institutional characteristics, including sector, Carnegie classification, campus setting, FTE enrollment, and number of tenured/tenure track faculty on an institution's score of sustainability, as measured by the Sustainability Tracking, Assessment, and Rating System (STARS) developed by AASHE, including education/research, operations, and planning/administration (and affiliated subcategories) across 200+ institutions.

Population Demographics

This study included the 204 four-year, U.S.-based, colleges and universities who submitted surveys to the STARS program through December 2013. The descriptive statistics for both independent and dependent variables are included in Tables 2 through 5. Table 2 includes the mode, median, mean, and standard deviation for the cumulative scores from the three STARS categories. "Education & Research" scores showed a mean score of 52.79, on a scale from 1 to 100 (SD = 17.31), while "Operations" scores averaged 38.56, on the same scale (SD = 10.21), and "Planning, Administration, & Engagement" was 58.70 (SD = 13.23).

Table 3 provides the total counts of the Carnegie classification, and Table 4 the campus setting for each institution, as included within the IPEDS database provided by the U.S. Department of Education's National Center for Education Statistics. Each major Carnegie

Table 2

Descriptive Statistics for Independent Variables (STARS scores)

Variable	<i>Mode</i>	<i>Mdn</i>	<i>M</i>	<i>SD</i>
Education & Research	57.93	51.74	52.79	17.31
Operations	42.33	39.03	38.56	10.21
Planning/Administration/Engagement	58.97	59.36	58.70	13.23

Note: N = 204.

Table 3

Descriptive Information for Dependent Variables

Carnegie Classification	<i>N</i>
Baccalaureate Colleges: Arts & Sciences	43
Baccalaureate Colleges: Diverse Fields	06
Master's Colleges and Universities (larger programs)	34
Master's Colleges and Universities (medium programs)	12
Master's Colleges and Universities (smaller programs)	09
Doctoral/Research Universities	10
Research Universities (high research activity)	31
Research Universities (very high research activity)	59

Note: $N = 204$. Coded as a categorical variable (1-8).

Table 4

Descriptive Information for Dependent Variables

Campus Setting	<i>N</i>
City (large/midsize/small)	113
Rural (distant/fringe/remote)	6
Suburb (large/midsize/small)	45
Town (distant/fringe/remote)	40

Note: $N = 204$. Coded as a categorical variable (1-4).

classification is represented: Baccalaureate Colleges (49), Master's Colleges and Universities (55), and Doctoral Research Universities (100). While all four campus settings were represented (city, suburb, town, and rural), over half the responding institutions were from cities (113) and very few were from rural areas (6). As these variables are categorical, dummy variables were used.

Table 5 details the mode, median, mean, and standard deviation for tenured/tenure-track faculty and fall 2012 semester student enrollment of participating institutions. The mean number of faculty at a respondent institution was 617 (SD = 566.97). Average fall student enrollment for respondents was 16,037 (SD = 14,430.57). These wide standard deviations demonstrate the wide variety of participating institutions.

Regression Analysis

The use of multiple regression with this specific study is to examine not just any potential correlations that might exist between STARS scores and institutional characteristics, but the strength of the relationship between variables as well as the direction of that relationship (positive or negative). The end goal is the development of a prediction model whereas one could hypothesize their STARS score based on the institutional characteristics within the regression model. As this specific study has more than one dependent variable, multivariate regression analysis was used in the R statistical computing and graphics program.

Table 6 details the results of the multivariate regression analysis used to predict an institution's STARS score. Examining the results, the number of tenure and tenure-track faculty ($p = <.01$) is the only variable that contributed to the prediction model. While it is a statistically significant variable, the impact of the variable was minimal at best, although positive. Tables 7

Table 5

Descriptive Statistics for Dependent Variables

Variable	<i>Mode</i>	<i>Mdn</i>	<i>M</i>	<i>SD</i>
Tenure/Tenure-Track Faculty	116	434	617	566.97
Fall Student Enrollment	2,070	11,942	16,037	14,430.57

Note: $N = 204$.

Table 6

Summary of Multivariate Regression Analysis for Variables Predicting STARS Scores

Variable	β	<i>SE</i>	<i>t</i>	<i>p</i>
Total STARS Score				
Intercept	55.16	3.57	15.47	<.001
Carnegie Classification	.13	.51	.26	.79
Number of Faculty	.01	<.01	2.91	<.01
Sector	-1.48	2.38	-.62	.53
Campus Setting	-.09	.81	-.11	.92
Number of Students	<.01	<.01	-.14	.89

Notes: $N = 204$. $R^2 = .13$.

Table 7

Summary of Multiple Regression for Variables Predicting “Education & Research” STARS Score

Variable	β	SE	t	p
Education & Research				
Carnegie Classification	.13	.51	.26	.79
Number of Faculty	.01	<.01	2.91	<.01
Sector	-1.48	2.38	-.62	.53
Campus Setting	-.09	.81	-.11	.92
Number of Students	<.01	<.01	-.14	.89

Note: $R^2 = .12$.

Table 8

Summary of Multiple Regression for Variables Predicting “Operations” STARS Score

Variable	β	<i>SE</i>	<i>t</i>	<i>p</i>
Operations				
Carnegie Classification	.12	.04	.38	.70
Number of Faculty	<.01	<.01	1.32	.18
Sector	-3.64	1.92	-1.90	.06
Campus Setting	1.13	.65	1.70	.09
Number of Students	<.01	<.01	.87	.39

Note: $R^2 = .05$.

Table 9

Summary of Multiple Regression for Variables Predicting “Planning, Administration, & Engagement” STARS Score

Variable	β	SE	t	p
Planning/Administration/Engagement				
Carnegie Classification	.13	.51	.26	.79
Number of Faculty	<.01	<.01	2.92	<.01
Sector	-1.48	2.38	-.62	.53
Campus Setting	-.09	.81	-.11	.92
Number of Students	<.01	<.01	-.14	.89

Note: $R^2 = .13$.

through 9 detail the multiple regression analysis for each STARS variable. By examining each STARS category, only “Education & Research” and “Planning, Administration, & Engagement” produced significant results for the faculty variable; no variables were significant for “Operations” scores. Also note that the Variance Inflation Factor (VIF) for the dependent variables each fell under 5, so there were no apparent issues of collinearity (Education & Research = 3.56, Operations = 2.51, Planning, Administration & Engagement = 1.57).

CART Analysis

Classification and Regression Trees (CART) are a way of analyzing data to create decision-making trees (Lewis, 2000). Compared to multivariate regression models, CART analysis can be more beneficial given its non-parametric nature. In other words, the normal assumptions that accompany logistic regression are not required.

The CART analysis essentially divides variables into as many potential combinations as possible, creating a graphical representation of the optimal combination of independent variables to explain the dependent variable. For this study, a separate CART analysis was performed for each of the STARS scores categories. The decision trees show the breakdown of scores depending on the criteria of a specific variable, leading to multiple combinations of variables (called a terminal node) which results in a specific pathway’s mean score (in this case, the mean STARS category score).

The CART analysis provides a unique opportunity to review the dataset that multivariate regression analysis does not provide. Essentially, by placing the data into every permutation possible and looking for every significant interaction of variables, the “nodes” created by the CART analysis suggestion institutional profiles for each STARS score category, both at higher

and lower significant scores than the mean score of the full dataset. By examining these “nodes” we get a better sense of those institutions that are successful in achieving higher STARS scores.

Education & Research

Figure 1 shows the CART analyses for the “Education & Research,” “Operations,” and “Planning, Administration, & Engagement” scores, respectively. Table 10 provides a legend describing the specifics of each categorical variable. The mean “Education & Research” score for all 204 institutions was 52.79. There were a total of 16 terminal nodes created from the CART analysis. A review of those scores with much higher mean scores (> 61) reveals five institutional profiles:

1. All Carnegie classification (except for Master’s Colleges & Universities [smaller programs] and Research Universities [very high research activity]) and less than 45.5 faculty = 69.36.
2. All Carnegie classifications (except for Master’s Colleges & Universities [smaller programs] and Research Universities [very high research activity]), less than 2,466.5 students and less than 144 faculty = 61.08.
3. All Carnegie classifications (except for Master’s Colleges & Universities [smaller programs] and Research Universities [very high research activity]), less than 13,753.5 students and less than 434 faculty = 66.31.
4. All Carnegie classifications (except for Master’s Colleges & Universities [smaller programs] and Research Universities [very high research activity]), less than 10,273.5 students and less than 301 faculty = 65.82.

Table 10

Legend for Categorical Independent Variables

Variable Name	Code
<hr/>	
Sector	
Private	1
Public	2
Carnegie Classification	
Baccalaureate Colleges: Arts & Sciences	1
Baccalaureate Colleges: Diverse Fields	2
Doctoral/Research Universities	3
Master's Colleges and Universities (larger programs)	4
Master's Colleges and Universities (medium programs)	5
Master's Colleges and Universities (smaller programs)	6
Research Universities (high research activity)	7
Research Universities (very high research activity)	8
Campus setting	
City	1
Rural	2
Suburb	3
Town	4

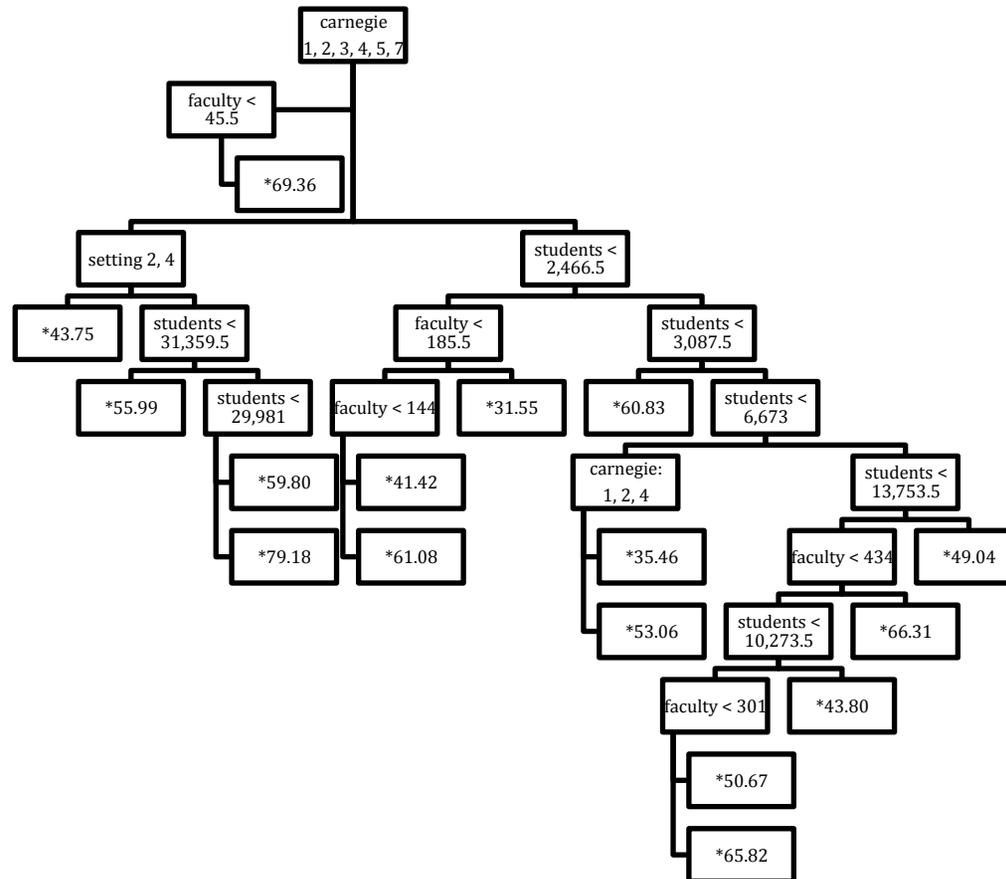


Figure 1: CART analysis of “Education & Research” STARS scores. Each “branch” of the tree is called a “node” and breaks depending on a specific variable characteristic. When a significant mean score is reached (marked with an asterisk), it is referred to as a “terminal node.” In other words, following a branch to its terminal node, results in the mean “Education & Research” score for institutions that share similar characteristics.

5. Master's Colleges & Universities (smaller programs) and Research Universities (very high research activity), located in city or suburb settings, and more than 29,981 students = 79.18.

What these successful profiles suggest is the importance of the number of tenured and tenure-track faculty, as well as the faculty-student ratio. The first four profiles suggest smaller, liberal-arts type, institutions, such as Green Mountain College, which have high STARS ratings, as well as the Ivy League universities, including Columbia and Cornell. The final profile suggests those large, urban, public, institutions, with large student bodies and large numbers of faculty, such as Arizona State University or New York University. While these types of institutions might represent polar opposites of institutional size, they both feature faculty with high expectations of university service.

Operations

The mean "Operations" STARS score was 38.56. The CART analysis (Figure 2) created 11 terminal nodes of which only two suggested profiles with means higher than 43.00:

1. Baccalaureate Institutions (Arts & Sciences) and Research Universities (very high research activity) with more than 1,581.5 students = 43.07.
2. Masters Colleges & Universities (smaller and medium programs), located in a suburban setting, with more than 3,437 students = 47.44.

It is interesting to note how low the operations scores are in general. While the "Education & Research" scores have a median of 52.79 the highest potential median score, per the CART analysis, is over 25 points higher. The highest potential "Operations" score, per the CART analysis is only 9 points higher. This demonstrates just how difficult achieving a high score in this category can be. As with the "Education & Research" scores, here those institutions

with very high operations scores come from those colleges and universities on the separate ends of the demographic spectrum: very high research institutions and those best classified as “Ivy League” or “liberal arts”, as well as those located in suburb areas.

Planning, Administration & Engagement

Finally, the “Planning, Administration, & Engagement” CART tree resulted in 15 terminal nodes (Figure 3). The mean “Planning, Engagement, & Administration” score was 58.70. An examination of those scores with significantly higher means, suggests the following institutional profiles:

1. All Carnegie Classification (with the exception of “Research Universities [very high research]”) with more than 416 faculty and less than 13,503.5 students = 70.73.
2. Research Universities (very high research) with more than 14,183.5 students that are private institutions = 75.96.
3. Research Universities (very high research) with more than 14,183.5 students that are public institutions with more than 1,173 faculty = 71.24.
4. Research Universities (very high research) with more than 14,183.5 students that are public institutions with less than 1,173 faculty and more than 29,981 students = 66.48.

Here, we see the influence of faculty quite broadly; regardless of type of Carnegie Classification, having a larger number of faculty, as suggested by the multivariate analysis, can increase an institution’s score in “Planning, Administration, & Engagement.” This is especially true in those institution classified as Research Universities (very high research). Given the large amounts of capital, in terms of tenured/tenure-track faculty, administrators, and administrative professionals – including in the field of sustainability – this should be expected, regardless of sector.

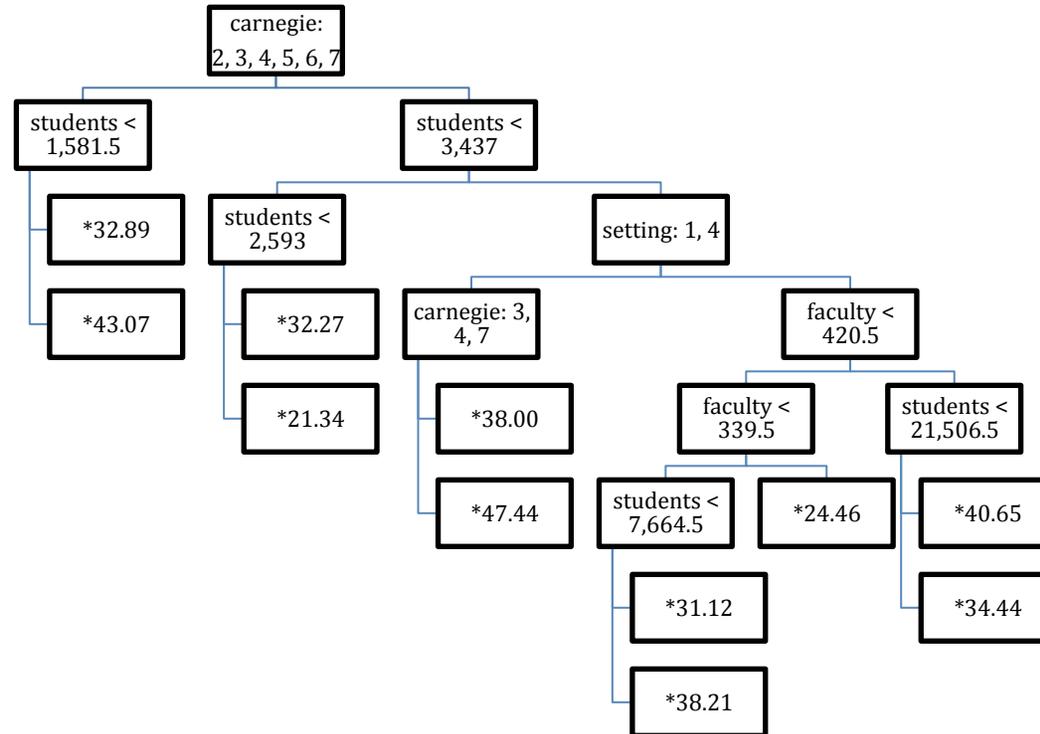


Figure 2: CART analysis of “Operations” STARS scores. Each “branch” of the tree is called a “node” and breaks depending on a specific variable characteristic. When a significant mean score is reached (marked with an asterisk), it is referred to as a “terminal node.” In other words, following a branch to its terminal node, results in the mean “Operations” score for institutions that share similar characteristics.

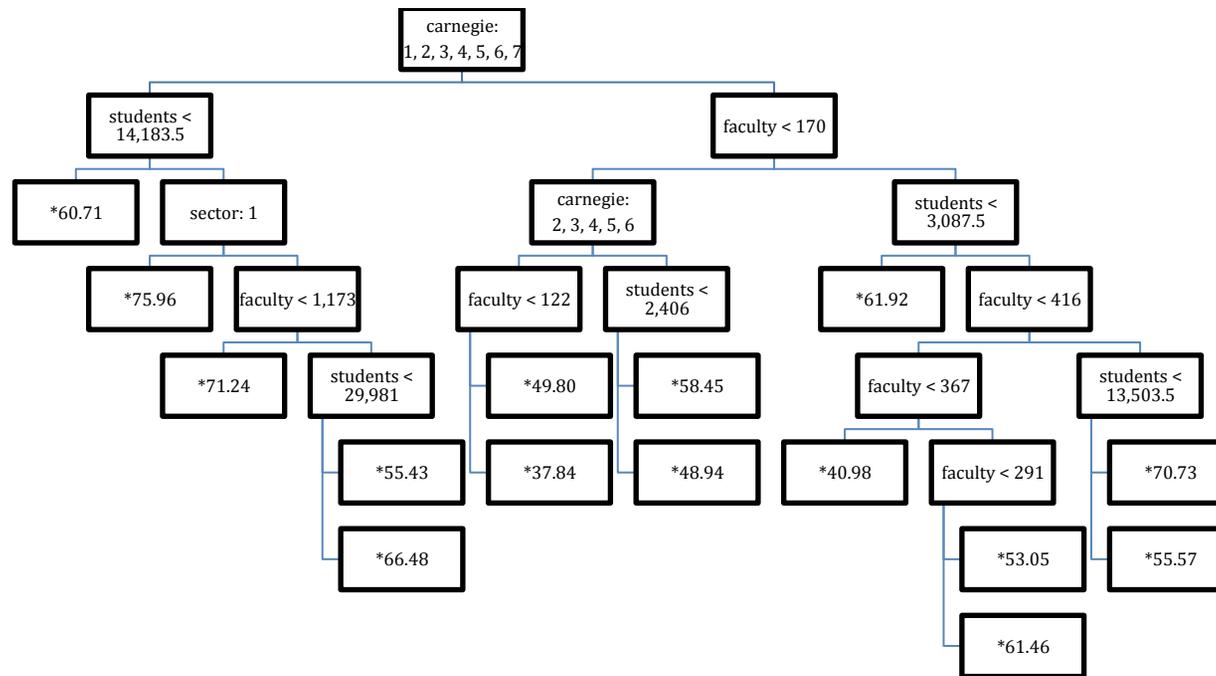


Figure 3: CART analysis of “Planning, Administration & Engagement” STARS scores. Each “branch” of the tree is called a “node” and breaks depending on a specific variable characteristic. When a significant mean score is reached (marked with an asterisk), it is referred to as a “terminal node.” In other words, following a branch to its terminal node, results in the mean “Planning, Administration & Engagement” score for institutions that share similar characteristics.

Summary

The multivariate regression analysis of the variables suggests that of the institutional characteristics examined, only the number of tenured/tenure-track faculty produced a significant impact on an institution's STARS scores. While the significance value was strong, the impact on the regression model itself was minimal. In addition, a CART analysis created three decision trees to explain potential mean scores for each of the STARS' scoring categories. In essence, each node presented a potential organizational profile resulting in a mean score for institutions that meet that profile. By reviewing those profiles with significantly higher mean scores than the population, we are given an idea of how institutions of higher education who are more successful in their sustainability efforts are structured.

CHAPTER FIVE

DISCUSSION

Project Summary

In an attempt to create a comprehensive sustainability assessment tool, AASHE created STARS to aid institutions in their sustainability planning. To date, over 200 four-year, U.S. based, colleges and universities have received a STARS rating, however little research has been done on the results produced by the STARS instrument.

This study aimed to examine the role institutional characteristics play in a school's STARS attainment. Specifically, it examined if an institution's campus setting, Carnegie classification, sector, number of tenured/tenure-track faculty, and student enrollment would suggest an institution's STARS score.

As discussed in Chapter four, the multivariate regression analysis performed on the dataset of STARS and IPEDS data indicated that the number of tenured/tenure-track faculty influenced an institution's STARS score. In examining each of the three STARS score categories, "Education & Research" and "Planning, Administration, & Engagement" produced statistically significant results, both positive, on the faculty variable. The "Operations" STARS scores did not suggest a significant institutional variable.

In addressing the study's research question, we can say, "Yes, one institutional characteristic suggests a relationship to the attainment of sustainability within four-year higher educational institutions in the United States, specifically the number of tenured/tenure-track faculty." This also confirms the hypothesis that there is a statistically significant relationship between institutional characteristics and that institution's sustainability score.

In addition, the CART analysis suggested a number of potential institutional profiles of those colleges and universities who scored higher than mean for each STARS score. In general, those institutions with Carnegie classifications of “Research Universities (very high research)” and “Baccalaureate Colleges (Arts & Sciences)” produced higher means, which tend to match those institutions receiving the highest STARS rank.

Independent Variables

Carnegie Classification

An institution’s Carnegie classification was not found to be a significant variable within the multivariate analysis. Within the CART analysis however, an institution’s Carnegie classification played a major role in helping separate the various nodes. In fact, within each of the STARS score categories, an institution’s Carnegie classification provided the first division into organizational profiles. As mentioned earlier, those institutions falling into the Research University (very high research) and Baccalaureate (Arts & Sciences) categories almost always created higher mean scores than those from other classifications.

The reasoning for this might simply come from how an institution’s Carnegie classification is created. Essentially, the majority of data utilized in determining an institution’s Carnegie classification comes from the IPEDS database itself, as well as the National Science Foundation, and the College Board (Carnegie Classification, 2014). Because the Carnegie system does an efficient job at dividing institutions by IPEDS characteristics, it creates a good first step in separating institutions, even when examining their STARS scores, which proved valuable in the CART analysis.

Campus Setting

Campus setting (city, rural, suburb, town) also did not produce a significant result, either in the multivariate regression or within individual STARS scores categories. Perhaps one reason this score was not significant was due to the fact that the highest scores were produced from two opposite categories: city and town. The results of the CART analysis suggested that high-level research institutions, which typically reside in city environments, and liberal arts/Ivy League institutions, which tend to be located in smaller towns, produced higher than average STARS scores. As such, the regression analysis would be unable to produce a direction of influence for the variable. In addition, there might also be a connection between the type of Carnegie classification and campus setting, in that those institutions from rural and suburban areas tend to fall outside of the Baccalaureate and Research (very high level) classifications.

Sector

The same reasoning for the “campus setting” variable might also be true for the “sector” variable. High-level research institutions can either be public (state universities) or private (Ivy League), and “liberal arts” institutions, especially in the STARS dataset, are generally from the private sector. As with campus setting, it might have been difficult for the regression analysis to determine a direction of significance for this categorical variable because both sectors produced the variety of scores with no clear direction. This tells campus sustainability leaders that neither private nor public institutions have an advantage in assessing and rating their sustainability efforts.

Number of Students

Here again, the not significant results might be the opposite ends of the spectrum playing against each other, as the most successful colleges and universities feature both quite high enrollment (such as Arizona State University and other public very high-research institutions)

and quite low enrollment (Ivy League institutions and smaller liberal arts colleges, such as Green Mountain College). Given the significance of the faculty variable, what this might further suggest is that, student-faculty ratio could play a role.

In general, it could be said that liberal arts and Ivy League institutions have a larger number of tenured/tenure-track faculty per student than medium sized institutions, while high-level research institutions have large numbers of adjunct and graduate student instructors to take on much of the teaching load. This would provide more faculty-student interaction in higher-level courses, in research settings, and community/campus projects, including those involving sustainability. In relationship, therefore, to an institution's STARS score, the size of the student body does not play a significant role.

Number of Tenured/Tenure-Track Faculty

The results of the multivariate analysis only present a part of the full picture. The suggested significance between the faculty variable and one's STARS scores, while positive, was small. Having the number of tenured/tenure-track faculty as the only significant variable also asks larger questions, such as: Why are faculty members significant in suggesting a STARS score? What role do faculty members play in an institution's sustainability efforts? To address these questions, it helps to return to the literature, as well as the influence faculty members often hold in institutional decision making, specifically as it relates to the STARS score categories.

As mentioned in Chapter four, faculty members have been shown to have an influential role in an institution's success. In researching how to best create internal support and motivation for strategic planning and initiatives, Welsh et al. (2006), found their role within the institution to be a significant influence. In other words, whenever faculty members felt their increased

influence on the strategic planning process, the more supportive they were of the final plan and its implementation.

The same could be said to be true when examining sustainability. If the sustainability movement within an institution is embraced or originates within the faculty ranks, then it more than likely is already in a position to be successful. From an organizational perspective, faculty members are in a unique place in that they influence the curriculum and research, and therefore influence student learning. In addition, through shared governance, they can influence administrative policy, planning, and direction. This position of influence over both students and administrators helps imply why the faculty variable played a significant role in the analysis, specifically the “Education & Research” and “Planning, Administration & Engagement” scores.

The “Education & Research” questions focus on curriculum, programs of study, and research interests, and how each relates to sustainability. Essentially, this category is almost entirely faculty member driven. The more faculty members are engaged in developing new sustainability courses and pursuing research agendas related to sustainability, the higher an institution’s STARS points. While these questions are scored as a percentage (i.e., How many faculty as a percentage engage in sustainability research?), colleges and universities with a higher number of tenured and tenure-track faculty often assign “research time” as part of their faculty load; thus, scholarly production is as an expectation of their positions. This might not be true at smaller, mid-size, or primarily instructional, institutions (Huyser, 2004).

From a “Planning, Administration & Engagement” perspective, the questions within this category are also potentially influenced by those in the professoriate. Areas such as sustainability coordination, sustainability planning, and governance, might be led by faculty members interested in sustainability, not just sustainability professionals or facilities personnel.

As with “Education & Research,” faculty members in institutions with a large number of tenured and tenure-track faculty members may also have time dedicated to institutional service, which could be related to sustainability initiatives. These higher ranked institutions also tend to have more STARS points in areas related to employee health and wellbeing, including compensation, satisfaction, and wellness.

Given their responsibilities to teach, research, and service, tenured and tenure-track faculty members find themselves in a distinctive position, both as academics, and as professionals in general. Institutions with higher numbers tenured and tenure-track faculty members also tend to have smaller teaching loads, assistance from undergraduate and graduate students, expectations to produce research, and ample opportunities for university service. In this way, they are able to guide sustainability into the classroom, into the laboratory, and into institutional governance and planning.

Because of the importance of strategic planning in institutional sustainability, it is important to note the role of faculty in any institutional planning in the literature. As noted by Shipman, Aloii, and Jones (2003) in discussing assessment in higher education, faculty members participating in the planning and assessment process can lead to new interactions between faculty members, faculty members and students, and faculty members and administrators. In addition, faculty members help influence and develop institutional missions, goals, outcomes, and how the institutions operates in general.

In looking at strategic planning from the other perspective, Welsh et al. (2006), found that in both strategic planning and implementation of those plans, the “type of institutional decision making” (p. 693) to be the most important factor in engaging faculty members in the process. They suggested that faculty member participation in the planning and implementation

process is vital for integration and success; this could be also be said for sustainability planning as well. When they are given access and input throughout the sustainability planning process, they not only take a more active role, but contribute their expertise as well, while increasing the possibilities for success, regardless of institutional type, setting, or sector.

In addition, parallels can be drawn between institutional efforts at improving their research profile and their sustainability efforts. Specifically related to leadership, Shera (2008) found that within the strategic planning process, faculty development, community partnerships, and integration with the institution's goals and objectives are vital to improving an institution's research culture. The same could be said for sustainability: the more faculty members feel that sustainability can be ingrained into the organizational culture and curriculum under their leadership, the more community partnerships are made to address pressing issues in improving the environment, and the more closely an institution's strategic plan can align with its sustainability goals, the better chance it has at achieving those goals. As in university research, organizational change hinges on the dedication, knowledge, and leadership of faculty.

Simply asking an institution's faculty members to identify those courses they already teach that either include, or could include, aspects of sustainability, can increase aspects of sustainability within the curriculum (Sammalisto & Lindqvist, 2007). This was accomplished both through faculty self-identification and through an increased awareness by faculty and staff of environmental issues. Once faculty members had an understanding of the sustainability goals of both the nation (e.g., Sweden) and higher education in general, they quickly began identifying courses, integrating sustainability into their research agendas, and working on increasing sustainability efforts on the campus, with the end result of graduating more environmentally aware students. Having an institution's faculty ranks empowered in both knowledge and the

ability to shape the curriculum (and their campus) to meet sustainability goals, proved effective in increasing an institution's sustainability efforts.

While the literature definitely suggests that faculty members can and often have a role in both sustainability efforts at their respective institutions, as well as in the strategic planning process, the influence of faculty productivity models should also be discussed, as any sustainability-related tasks will be included along with other aspects of a faculty member's individual workload. To help better influence how faculty members approach their expected productivity (from both a personal and institutional perspective), Estes and Polnick (2012) made a number of recommendations which were steeped in motivational and expectancy theories. These included ensuring that assessment policies and methods included areas where productivity was an expectation and those activities were directly impacted in decisions related to tenure, merit pay, etc. In turn, they note, this could also have a positive effect on faculty recruitment efforts.

In a different study, this time examining faculty productivity and job satisfaction, Mamiseishvilli and Rosser (2011), found that the activities of research, service, and graduate teaching complemented each other and that those faculty members engaged fully in these three areas tended to have high levels of job satisfaction. Because undergraduate teaching and service were both negatively related to job satisfaction, the authors call on higher education institutions to reexamine the rewards systems related to these activities, including merit pay, institutional prestige, and decisions regarding tenure. In other words, all types of productive should be fully recognized by the institution. Here, sustainability could play a role in two ways: first by noting that faculty who integrate sustainability into their research, service, and graduate teaching duties will continue to hold high levels of job satisfaction while assisting the institution reach its

sustainability goals, and second, helping provide a platform or framework for institutions to better recognize faculty members' efforts in integrating sustainability into the undergraduate curriculum and in service activities. By increasing awareness of, and rewards for, these activities, institutions could meet their sustainability planning goals while also potentially increasing job satisfaction.

While some researchers have downplayed the continued importance of shared faculty governance systems (Crellin, 2010), others continue to stress the importance of the shared model, especially in long-term planning, which offer important insights into sustainability planning. Johnson (2003) discussed a number of benefits of shared governance for faculty members, including the “development of or consensus among faculty on educational or institutional goals” (p. 59). For institutions looking to further their sustainability plans, having a model that allows faculty members and administrators to share in the decision making, planning, and implementation process, will help bring faculty members from across campus together in a shared space to best plan on how to create benchmarks to achieve their sustainability goals.

In general, and as evidenced in the literature above, the number of tenured and tenure-track faculty might have proven a significant variable in the multivariate analysis because of their unique role within academia. Faculty members impact almost every aspect of university life, most especially student learning (through curriculum development), research, and, when properly encouraged and provided, strategic planning. As such, when sustainability become a goal of students, faculty, administrators, or all of the above, there is already a framework in place to allow faculty to integrate sustainability practices into every aspect of their profession, thus impacting student impressions of sustainability, advancing in knowledge related to sustainability

concepts, and improving the integration of sustainability in an institution's strategic planning process (Bland, Center, Finstad, Risbey, & Staples, 2006).

Discussion

In drawing these results back to the previous literature, one thing becomes clear: having a large number of tenured and tenure-track faculty and engaged student base is key to having a successfully sustainability program. When students desire to have their school increase sustainability efforts, they often partner with faculty to petition administrators. Likewise, when faculty members have an interest in sustainability, it permeates into the classroom, their research and outreach activities, and their professional and university service, usually influencing their students and peers along the way.

It is faculty members and students of constituents that can drive planning efforts, and the STARS assessment can provide the framework to help with the process. As Pagini (2008) noted, these efforts create legacies on multiple levels: the faculty have the opportunity to influence their students' future actions after graduation, as well as their professional lives, and in turn, influence the student's commitment to the institution they have invested in.

In terms of sustainability planning, a number of authors, including Eisen (2009), Calhoun (2008), and White (2003), discussed how sustainability has been and should be integrated in institutional planning. Institutions have a variety of models and methods available to integrate sustainability into their planning process so that sustainability plans, goals, and outcomes are tailor-fit to the needs of institutions. More so, since the STARS instrument was created to specifically aid in sustainability planning, by identifying areas of sustainability across institutions' entire spectrums, and then helping institutions gauge where they stand within each specific criteria measured, colleges and universities can address sustainability best practices.

It was presented within Chapter Two that the STARS assessment is the culmination of many previous attempts at measuring campus sustainability, and that STARS is the only one to address the entire institution. The results of this research, specifically, the multivariate analysis, seem to reinforce this notion. The ACUPCC action plans (2012b), National Wildlife Federation guide (Eagan et al., 2008), and the USGBC plan (Humblet, et al., 2010) address campus operations and student engagement through those operations. The role of faculty members is not given prominence, nor is institutions' curriculum, research agendas, or strategic plans. The Rocky Mountain Institute (Kinsley & DeLeon, 2009), does include faculty engagement at an administrative level, in planning oversight, but campus activities, including curriculum, research activities, and community engagement were not discussed; these are the areas that faculty excel in.

Likewise, the sustainability assessment tools discussed in Chapter Two negate the role of faculty in implementing sustainability on campus and in institutional planning activities. The Global Reporting Initiative (Fonseca, Macdonald, Dandy, & Valenti, 2010), has been used in higher education, but was not built for that sector. As such, its measurement criteria do not assess curriculum, engagement, student learning, research, or community engagement. Similarly, the LEED system (USGBC, 2013) only covers an institution's facilities, as it was not specifically created for use by higher education.

The Sierra Club (2012) and Sustainable Endowment Institute (2012) recently addressed earlier criticism of their metrics by forgoing their own assessment tools and utilizing STARS data. This did not just save sustainability administrators time in completing assessments, but leveled the playing field. Under this new arrangement, specific data already submitted to STARS was utilized by each organization in creating their rankings (Sierra Club, 2013). Given

these developments, and its holistic approach to measure sustainability in higher education, especially with the faculty and student components, the STARS assessment tool has become the *de facto* choice.

That said, as a tool and rating system, the STARS instrument, might appear to favor those “high-level” research institutions and smaller, baccalaureate “arts and sciences” institutions. The more likely case, however, is that those institutions are already in a place to have a good deal of leadership by faculty (and students), and those faculty help drive the direction of their institution from a strategic planning standpoint. Often colleges and universities left “in the middle” have a number of conflicting responsibilities and overloaded agendas, so that sustainability initiatives can be lost in the mix. In this way, the STARS instrument provides the opportunity for institutions to see where they currently stand, where their peers and goal institutions stand, and which specific measures they can address to become more sustainable. This study has reinforced the important role faculty play and the challenges institutions face to revise their curriculum, operations, and administrative decision making to address the need to be more sustainable.

Limitations

There are a few limitations to this study. First, the results of the study are only suggestive of those institutions with an interest in sustainable practices, as demonstrated through their membership in AASHE and participation in STARS. In addition, membership in AASHE, or participation in the STARS program without membership, costs the institution either a membership or program fee; those institutions not wishing, or unable, to invest funds in the program could not participate. As such, it must be noted that these 204 participating colleges and universities do not represent a complete picture of higher education, not even of all U.S.-based four-year institutions, but only of STARS participants. However, the results could aid and

assist institutions beginning to assess their sustainability efforts to help find peer and goal institutions and in how campus sustainability leaders can position the institution for successful in their sustainability efforts.

Finally, the STARS data relies on institutional self-reporting and not traditional measures of reliability. At this time, there are no plans for third-party verification of responses, which would help with instrument reliability. As such, the results of the study are only as accurate as the institutional responses. Content validity has been addressed through pilot studies and the creation of a team of Technical Advisors (see Chapter three), however statistical validity, to date, has not been addressed, such as through a factor analysis. Until those additional steps to ensure validity and reliability of the STARS instrument, the results of any quantitative study could be inaccurate.

In addition, the STARS scoring itself has one potential flaw. Those institutions who are unable to address a specific criterion can label it as “Not Applicable” which removes the potential score from the institution’s base, thus not negatively impact an institution’s score. If an institution decides instead to “Not Pursue” a specific criterion, they are given a score of “0”, which negatively impacts an institution. No real guidance is given to an institution on the difference between the two responses, which could create confusion at the institutional level impacting some institution’s scores by choosing not to pursue each area addressed in the STARS instrument.

Finally, there are some institutional characteristics that might prove beneficial in a regression analysis that could not be included in this study because few institutions provided data, specifically those questions related to an institution’s endowments. Many respondents provided responses of “Not Applicable” or “Not Pursuing.” Even so, endowments have proved

good predictors of an institution's success in decision-making, including expenditures, graduation rates, and student retention (Gansemer-Topf & Schuh, 2006). Additionally, other sustainability measurement tools attempt to include endowment information, specifically related to investment strategies, including the ACUPCC (2012b). This area might be one of hesitancy by campus leaders, given the strong divestment movement during the apartheid era in South Africa, which is now being repeated with the focus on investments which contribute to climate change (Elder, 2008). As such, many institutions keep their investment strategies private, leaving STARS respondents unable to contribute to this important area.

Recommendations for Campus Sustainability Leaders

The initial results of the multivariate regression analysis were initially disappointing, as only one variable had a significant result. However, given the results of this study, and the influence of tenure and tenure-track faculty members on sustainability, a few recommendations could be suggested to those STARS participants, specifically their sustainability leaders (Presidents, Provosts, Director of Sustainability, etc.) wanting to improve their sustainability efforts.

1. Utilize faculty governance systems to allow faculty members to have the ability to create their own policies and programs related to campus sustainability, both within and outside the classroom.
2. Ensure that sustainability is integrated into faculty productivity efforts, and is appropriately awarded through the promotion and tenure process, as well as merit pay considerations, as appropriate. This includes integrating sustainability into faculty members' teaching, research, and service. Doing this will naturally increase an

institution's STARS scores, as it directly addresses "Education & Research" and "Planning, Administration, & Engagement" scores.

Recommendations for Future Study

The STARS database continues to offer interesting areas for future study. From a quantitative perspective, it would be interesting to see what other potential institutional demographics are significant to higher STARS scores, especially if one isolated a specific variable, such as Carnegie classification. In addition, the STARS instrument itself now has enough responses that a factor analysis would be beneficial to examine the ability of the instrument to best survey the data it is looking to collect. Either of these analyses would continue to help further develop the STARS instrument, provide data to participating institutions, and contribute to the area of sustainability in higher education.

From a qualitative perspective, it would be interesting to continue the discussion on the planning process in sustainability, perhaps through interviews or focus groups with faculty, administrators, students, and sustainability professionals on the STARS data collection process at the institutional level and how the results are utilized by institutions in developing sustainability plans. Are the questions being asked in the STARS instrument directly influencing how participants plan for sustainability at the classroom, facilities, and administrative level (among others)? Are the results of peer institutions being examined to help in sustainability planning? Having these questions addressed would both help continue the development of the STARS instrument, but also provide other institutions best practices on how to utilize the data available.

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