

12-2012

# BUILDING SOCIAL INFRASTRUCTURE THROUGH PUBLIC-PRIVATE PARTNERSHIPS: THE CASE OF STUDENT HOUSING IN PUBLIC HIGHER EDUCATION

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BUILDING SOCIAL INFRASTRUCTURE THROUGH PUBLIC-PRIVATE  
PARTNERSHIPS: THE CASE OF STUDENT HOUSING IN PUBLIC  
HIGHER EDUCATION

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A Thesis  
Presented to  
the Graduate School of  
Clemson University

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In Partial Fulfillment  
of the Requirements for the Degree  
Doctor of Philosophy  
Planning, Design and the Built Environment

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by  
Bruce Kevin Cole  
December 2012

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Accepted by:  
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## ABSTRACT

Evaluations of Public-Private Partnership arrangements as alternatives to traditional government procurement methods for the delivery of public infrastructure projects have been anecdotal at best. This paper proposes a framework to evaluate a public university's infrastructure asset management performance and a specific measure based on a new concept of the elapsed time required for services to be delivered (i.e., Project Completion Time). The results suggest that the choice to use a public-private partnership as a project delivery method for student housing at a public university can dramatically shorten the overall schedule. This research will serve as the foundation for future quantitative research on the relationship between PPPs and the performance of various types of public projects.

## ACKNOWLEDGEMENTS

God has truly blessed me, that I have been able to pursue this most exciting work at this point in my career. I will be forever thankful for this. I would like to extend my deepest gratitude to my dissertation committee for their ongoing support and advice throughout the preparation of this dissertation. My advisor and committee chair, Dr. Elaine Worzala, ceaselessly encouraged me to clarify my research objectives, maintain the proper focus on the methodology and remain committed to high quality standards for my work. I offer my sincere thanks to my other committee members, Drs. William Bridges, Cliff Ellis and Olga Kaganova for their constructive suggestions and direction that encouraged me to always ask deeper questions into the related disciplines of data analysis, urban planning, real estate development and public asset management. I owe Dr. Worzala a special thank you because I would not have joined the doctoral program in Planning, Design and the Built Environment at Clemson were it not for the special care and concern that she conveyed for me and my family.

I would also like to thank Paul Williams, Executive Director of the Dormitory Authority of the State of New York who was always accessible for my numerous questions and requests for essential background information. Christine McUmbler, Director of Administrative and Resource Management and her staff at UC Davis were also very helpful and never hesitated to provide information requested regarding their student housing operations. I would also like to thank my colleagues and students at Southern Wesleyan University whose encouragement and support helped me through

some of the most difficult periods during my doctoral program. Finally, and perhaps, most importantly, I would like to thank Lee White, Executive Vice President of George K. Baum & Company, for access to the company's deal files and transaction database, and for his guidance regarding the direction of my work.

I thank my mother and father, Dorothy and Edward Cole, who continue to be an inspiration to me in my pursuit of scholarship and enlightenment.

Finally, I would like to thank my wife, Lady June, my son Julian and my daughter, Caira, for their support and patience throughout my doctoral education. Without their understanding and sacrifices, I would not have completed the program or this dissertation. They are the light of my life and I will be forever grateful for their unconditional love and understanding.

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## CHAPTER ONE

### INTRODUCTION

#### 1.1 Overview

The focus of this study is to explain why many state universities choose to use public-private partnerships (PPPs) as a contract procurement method for developing new, on-campus student housing. PPPs are arrangements whereby an academic institution uses non-recourse financing (i.e., the school is not borrowing the money) and where private third party entities are responsible for the funding, development and operation of the new facilities. The earliest reported use of PPPs in the development of student housing at public universities was in 1986 at the University of California, Davis campus. According to the professional literature, as well as, interviews with industry experts, the ability to obtain off-balance sheet financing was a major incentive for public institutions to use PPPs for residence hall construction prior to the adoption of new government financial reporting standards in the early 1990's (Government Accounting Standards Board [GASB], 1991; 1999; 2010; A. Bonnett, V.P. of Real Estate, EAH, Inc. Interview granted June 5, 2012).

PPPs of the type used for these “stand alone” projects (where the private partner recovers expenses and gets profit from a revenue stream generated by the property built) gave universities an instrument to avoid borrowing. By using third parties to finance residence hall projects, financially healthy colleges and universities are able protect their

credit rating and debt capacity and use this borrowing power to build other, higher-priority buildings (e.g., classrooms and research facilities). At the same time, these arrangements allow financially stressed institutions to build facilities that would otherwise not be fundable. However, current government reporting standards require that a liability be recognized and reported in the university's financial statements when contractual obligations are imposed (e.g., university guarantees of lease payments or minimum vacancy rates) under a public-private partnership agreement.

The question still remains regarding why almost 300 student housing projects worth more than \$9.3 billion (Baum, 2011) have been completed at U.S. public and private universities since the late 1990's using PPPs. There are four fundamental drivers that could explain the demand for this alternative project delivery method: (1) cost savings, (2) improvements in product quality, (3) a decrease in project completion time, and (4) an increase in operational efficiency over time (Atkinson, 1999; Chan & Chan, 2004; Belassi & Tukel, 1996). This research looks at the impact that PPPs have on completion time for new on-campus student housing projects and tries to determine how the public partner's approach to managing residential facilities and the state regulatory environment influence this outcome. Future research will consider the impact of PPPs on project cost, construction quality and operational efficiency.

This study covers the period from January 1, 1998 to the end of 2011. These years are marked by the explosive growth in the use of PPPs in the development of student housing at American colleges after the initial experimentation with the concept at the University of California Davis campus. Since few universities maintained records on site

prior to 2000, this research only focuses on projects started after the beginning of that year. However, with the help of the George K. Baum database, a few additional specific projects were identified that spanned the period between 1998 and 2000 (e.g., Primero Grove and Colleges at LaRue at UC Davis) from which a rich set of data were obtained.

The mid-1980's witnessed the first attempts to integrate market-type mechanisms into higher education as a means to achieve a higher level of performance and accountability in the provision of student housing. The first record of a student housing-related PPP was Russell Park at the University of California Davis. See Figure 1.1. Located on the UC Davis campus, Russell Park was erected in 1986 as an apartment complex that specialized in housing for graduate students and students with families. It continues to be privately owned and managed by Tandem Properties. Tandem has a 30-year land lease agreement with the university stipulating that apartments at Russell Park be offered to student families before any other type of tenancy is considered and tenders the property to the university at the completion of the ground lease term. The Russell Park complex allowed the university to increase its graduate student housing capacity without affecting its credit rating or its net cash flow.



Figure 1.1: Russell Park, America's First Student Housing PPP (UC Davis, 2012; Permission to use photograph granted by DavisWiki.org)

The literature on PPP transactions examines their impact with respect to cost savings, the value of risks transferred and the operational efficiencies captured when compared to alternative project delivery methods. This study also examines projects with respect to the benefits that PPPs transfer to the university, but recognizes that other, non-project level variables influence decisions to engage in PPP arrangements and contribute to the overall project outcome. Of particular interest to this research are whether or not the type of state regulatory environment has an impact on project outcomes and whether or not the existence of a campus-wide student housing plan at the university level makes a difference.

This study measures the individual and combined effects of the contract procurement method (e.g., whether or not the university used a PPP), the type of higher education regulatory environment and the existence of a student housing plan on the project completion time for new student housing projects at land-grant colleges. Through the use of a least squares regression model, the research attempts to determine the impact of these and other, more project-specific attributes (e.g., unit style, materials, construction delivery method and building complexity) on the time it takes to complete a project. For the purposes of this research, the operating definition of project completion time is the elapsed time between the day a project is approved by the university's governing board to the day when the contractor receives a certificate of occupancy.

## 1.2 Problem Statement

Three-hundred seventy five years after the founding of Harvard College, America's first post-secondary institution established to train Puritan ministers, higher education has become one of the United States' greatest success stories. The Commission on the Future of Higher Education [CFHE], (2006) stated the following:

Whether America's colleges and universities are measured by their sheer number and variety, by the increasingly open access so many citizens enjoy to their campuses, by their crucial role in advancing the frontiers of knowledge through research discoveries, or by the new forms of teaching and learning that they have pioneered to meet students' changing needs,



these postsecondary institutions have accomplished much of which they and the nation can be proud (p. ix.).

Whereas the United States once led the world in educational attainment, recent data from the Organization for Economic Cooperation and Development indicate that the U.S. has dropped to 12<sup>th</sup> among major industrialized countries in higher education achievement across its population (OECD, 2005). Again, quoting CFHE:

American higher education has become what, in the business world, would be called a mature enterprise: increasingly risk-averse, at times self-satisfied, and unduly expensive. It is an enterprise that has yet to address the fundamental issues of how academic programs and institutions must be transformed to serve the changing educational needs of a knowledge economy. It has yet to successfully confront the impact of globalization, rapidly evolving technologies, an increasingly diverse and aging population, and an evolving marketplace characterized by new needs and new paradigms (p. xii).

Access to a college education has grown increasingly out of reach of the average U.S. family as a result of higher tuition costs and lower family incomes. According to the College Board (2011), between the 2002-03 and the 2011-12 academic years, published tuition and fees for in-state students at public four-year colleges and universities increased at an average rate of 5.6 percent per year beyond the rate of general inflation. This rate of increase compares to 4.5 percent per year in the 1980s and 3.2 percent per

year in the 1990s (College Board, 2011). This increase is partially driven by the decline in state support. The College Board (2011) also noted that state appropriations per full-time equivalent (FTE) student declined by nine percent in constant dollars in 2008-09, by another six percent in 2009-10, and by four percent in 2010-11. In 2010, average income was lower at all levels of the income distribution than it had been a decade earlier with declines ranging from 16 percent in inflation-adjusted dollars for the bottom 20 percent of families, and 11 percent for the top five percent, to three percent for families in the 60th to 80th percentiles (College Board, 2011).

While students and their families bear the immediate brunt of tuition increases, affordability is also a policy dilemma for those who are asked to fund higher education. Federal and state taxpayers are reluctant to pay for the costs necessary to support infrastructure maintenance costs and capacity upgrades at public universities. As institutional costs have gone up, state subsidies have decreased on a per capita basis. This trend has caused state institutions of higher education to put more emphasis on generating additional tuition revenue and alternative sources of funding (e.g., student housing).

Table 1.1 shows the growth of auxiliary revenue and expenditures (including hospitals, clinics and auxiliary enterprises) per full-time equivalent student at public research universities from 1995 through 2006<sup>1</sup>. Auxiliary enterprises include dormitories, bookstores and meal services at 149 public research institutions, including all 1862 land-grant colleges. In the table, revenues are a proxy for the annual cost of room and board to

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<sup>1</sup> Data derived from the Integrated Postsecondary Education Data System (IPEDS) 1996-2006.

the student. Likewise, expenditures are a proxy for the annual cost per student incurred by public research universities to provide housing and food services. The attractive annual gross profit margin (calculated as gross profit divided by revenue) and its relatively high compound annual growth rate (CAGR) of 9.3 percent suggest that auxiliary enterprise revenue is increasing in importance as an alternative source of funds for these schools. Note that the expenditure figures do not normally include the payment of debt service obligations or contributions to overhead costs which would actually make true expenditures higher. As a result, the margin figures may appear high. However, the net result, higher housing costs, is bad news for students who pay these rising fees (e.g., revenue to the university) as part of their overall annual educational cost package.

	<u>1995</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>CAGR</u>
Revenues	\$ 7,106	\$ 8,397	\$ 8,215	\$ 8,491	\$ 8,835	\$ 9,068	2.1%
Expenditures	\$ (6,351)	\$ (6,380)	\$ (6,439)	\$ (6,348)	\$ (6,713)	\$ (6,877)	0.7%
Gross Profit	<u>\$ 755</u>	<u>\$ 2,017</u>	<u>\$ 1,776</u>	<u>\$ 2,143</u>	<u>\$ 2,122</u>	<u>\$ 2,191</u>	9.3%
Gross Profit Margin	10.6%	24.0%	21.6%	25.2%	24.0%	24.2%	

Table 1.1: Average Growth in University-Related Hospital, Clinic and Auxiliary Enterprise Revenue and Expenditures per FTE student in 1995 and from 2002-2006 (in 2006 dollars) for U.S. Public Research Universities; Table developed from IPEDS data shown in several tables (Wellman, Desrochers, Lenihan, Kirshstein, Hurlburt, & Honegger, 2009, pp. 38-41, figures A3 and A5).

Tuition has increased as the portion of total state college revenue from state government appropriations has decreased. The Commission on the Future of Higher

Education found the price of state college programs (other than auxiliary enterprises) to be directly tied to the cost of providing educational services. Overall, the financial structures and governance procedures provide limited incentives for state colleges and universities to take aggressive steps to improve institutional efficiency and productivity. To improve affordability, the Commission proposed a focused program of cost-cutting and productivity improvements with improvements in institutional cost management and the development of performance benchmarks (CFHE, 2006, p. 2).

Even as tuition and housing costs continue to rise, student demand for U.S. higher education resources is expected to grow substantially over the next decade. Between 1995 and 2009, student enrollment at degree-granting, post-secondary schools in the U.S. increased by 43 percent. Total enrollment at U.S. post-secondary schools is expected to reach 22.7 million students of which 13.1 million will be in the 18-24 age-group, which is most likely to fuel demand for student housing and other auxiliary services. This represents a projected growth of 2.5 million students over the 11 year period, with 1 million new students, or 40 percent, falling within the 18-24 age-group (the group most likely to seek on-campus living accommodations). The bulk of this growth (72 percent) is projected to be at public institutions of higher education (Hussar & Bailey, 2011) as private U.S. universities are forecasted to lose applicants with middle-class families suffering most from their current static incomes, under-performing investments and high unemployment (Sanyal & Johnstone, 2011). See Table 1.2 for a projection of U.S. college enrollment by age-group.

<u>Age Group</u>	<u>2009</u>	<u>2020</u>	<u>Change</u>	<u>% Change</u>
18 - 25 years old	12.1	13.1	1.0	8%
25 - 34 years old	4.6	5.5	0.9	20%
35 years and older	3.5	4.1	0.6	17%
<b>Total Enrollment</b>	<u>20.2</u>	<u>22.7</u>	<u>2.5</u>	12%

Table 1.2: Projected Enrollment for all U.S. Postsecondary Degree-Granting Institutions, by Age Group for Fall 2009 and 2020 (adapted from Hussar & Bailey, 2011, p.21)

Faced with the tri-fold challenge of a growing student enrollment, an aging asset base, and a steady decline in state support, public colleges and universities have turned to public-private partnerships (PPPs) to leverage limited resources and help them be more responsive to the growing demand for student on-campus housing and increased public pressure to operate more cost effectively.

PPPs are a particular kind of market-type arrangement whereby a private sector provider (or network of providers) finances, designs, builds, maintains, and/or operates infrastructure assets traditionally provided by the public sector (specifically, state government agencies, in the case of U.S. public colleges and universities). Most public-private partnerships involve a single private sector entity that provides a public infrastructure asset for an extended period, generally 20-30 years. The asset usually reverts to the government agency at the end of this period. The private sector partner charges a fee for the use of the infrastructure asset over the life of the arrangement. This fee can be paid by the government (e.g., through a leasing arrangement) or through user

charges (e.g., college dormitory room charges), or a combination of the two (Blondal, 2005). Within the context of this study, the PPPs of most interest are those that are between public universities and private providers of student housing development and management services.

There are a number of reasons why public institutions of higher education are choosing to source their capital projects through PPPs. These include the ability to exploit the expertise of “best of breed” service providers, to free-up the university’s administrative resources so that it can concentrate on its core mission of educating students and pursuing research, to shift certain risk to third-party entities that may be better able to carry it (e.g., financial, delivery and market risk, among others), to leverage public assets (e.g., land) with private funds, and to increase the speed and flexibility with which the university can respond to changing end-user needs (Goldsmith & Eggers, 2004). It is the last perceived benefit that is the focus of this dissertation.

Government personnel and its traditional hierarchical procurement processes can make it difficult for state enterprises such as public universities to respond quickly to market feedback with respect to student housing needs. Private, third-party service provider networks, on the other hand, tend to be more nimble and flexible than the state-based bureaucratic hierarchies. The PPP arrangement can enable the government agencies (i.e., universities) to bypass stultifying procedures that may slow personnel movement or the acquisition of urgent materials or resources (Goldsmith & Eggers, 2004).

For student housing projects at public universities within the U.S., the time needed to work through state regulatory processes and obtain the required approvals for new projects can be substantial. Delays can increase overall project construction costs from five to ten percent, according to an analysis prepared for George K. Baum & Company, an investment banking firm (Goldstein, 2006). Public capital projects sourced through the traditional procurement process are subject to delay at four different points in the project lifecycle: (1) between the time of approval by the board of trustees and initial approval by the state governing authority; (2) between the time of state governing authority approval and signing of a design contract; (3) between the signing of a design contract and the approval and signing of a construction contract; and (4) between the signing of the construction contract and project completion.

Another reason why public and private colleges turn to public-private partnership arrangements is to preserve their borrowing power. PPP transactions are often accounted for as “off-balance sheet” transactions and, if structured properly, will not affect the existing financial ratios or debt covenants of the public partner in the venture (Goldstein, 2006). In theory, however, the financial structure of the transaction should not affect the economic substance of the PPP arrangement (Modigliani & Miller, 1958) or the project’s value to those receiving the benefits (value-for-money).

The evidence in the literature of the effective use of PPPs to generate project cost savings compared to alternative project delivery methods is inconclusive. Whereas project cost might be influenced by project delivery method, other variables such as project attributes (e.g., dining hall, underground parking, etc.), geographic region, the

state of the economy, market competitiveness and prevailing wage rates, among others, may make it difficult to determine the true cause and effect of any observed cost differences. Both Public Choice Theory (Williamson, 1996) and the PPP literature (Hodge & Greve, 2010) suggest that overall efficiency will most likely result from combining construction and operations management contracts under one service provider because this will generate lower “whole life” costs. In theory, this is what ultimately drives the demand for PPP arrangements.

Certain efficiency measures identified in the literature are related to the time it takes to complete a project. The goal of the proposed research is to examine the relationship between the choice of contract procurement method (i.e., to use a PPP or a traditional state procurement process) and the time required to complete an on-campus student housing facility at a four-year public university. The results of this research will be generalizable across all U.S. 1862 Morrill Act land-grant colleges and may have implications for other public institutions of higher education.

In addition, the research will propose a framework to determine the factors which influence the success of PPPs in achieving the goals of the academic institution with regard to new student housing construction. Some specific elements of the framework related to effective project execution will be validated with an analysis of data collected from a large sample of student housing projects and interviews with senior financial administrators and real estate professionals at public colleges and universities. The research findings will suggest practices that may affect some aspects of real estate portfolio management (e.g., greater use of student housing plans and better coordination



with other institutional planning groups) and provide insights that might help senior university real estate professionals in their selection of certain project attributes (e.g., unit style). Most importantly, the findings should provide insights to housing officials on how to better meet student demand for on-campus housing.

Figure 1.2 is a modification of the Perkman, Neely and Walsh (2011) framework for the evaluation of the key factors contributing to the success of university-industry alliances. It demonstrates how the success of an asset-development project relies on the effective management of four critical phases: input, in-process, output and impact. The clear boxes represent a “success map” for the development of a student housing project. The lower shaded boxes suggest the metrics for evaluating performance within each phase. As a map of the area of research to be explored, the circled box, “Effective Project Execution” represents the specific destination point of the work at hand. If a project manager is able to shorten the completion time of a given project by choosing to use a PPP, he or she will have achieved a preferred outcome. Shortening project completion time results in cost savings (e.g., with respect to interest expense and commodity price inflation) and increased overall project value. By accelerating the receipt of student housing payments the project’s present value increases, making it more attractive from a capital budgeting perspective. Similarly, in satisfying the demand for on-campus student housing, the asset manager can complement recruitment and retention efforts.

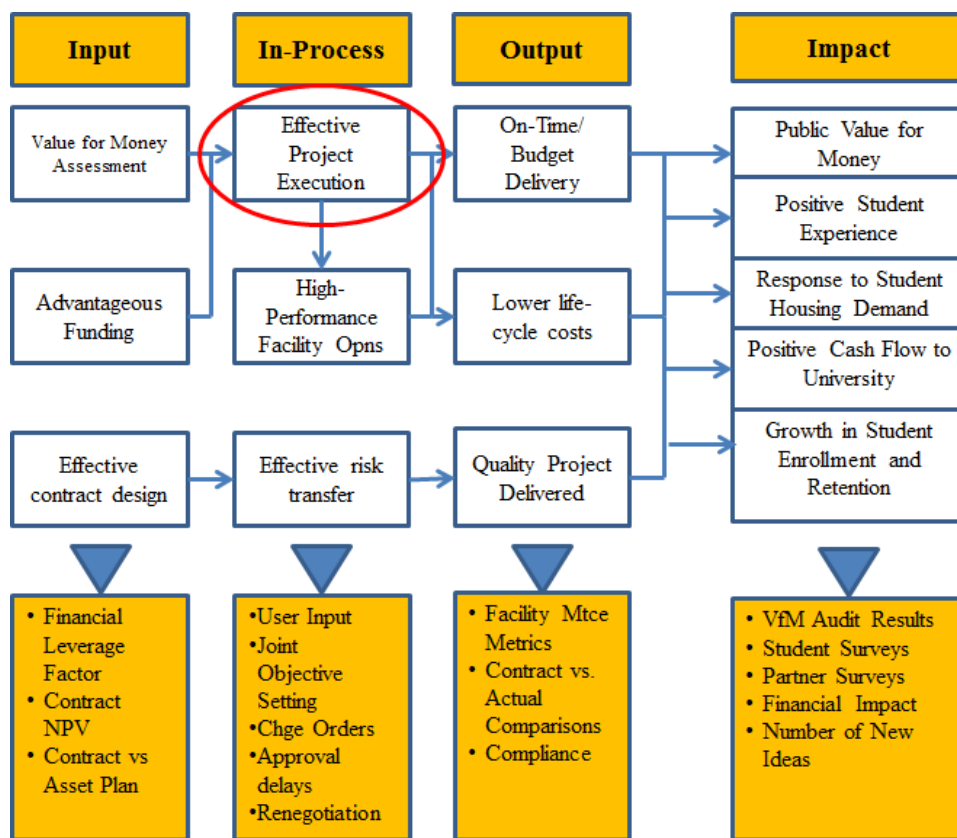


Figure 1.2: Generalized Conceptual Framework for Evaluation of PPP Success. Adapted from Perkman et al. (2011).

The final and most important phase of the framework involves the achievement of the outcomes (or impacts) which allow the public institution of higher education<sup>2</sup> to achieve state, institutional and student-level objectives related to the provision of a new residence hall. For state regulators, ensuring the project gives taxpayers' value-for-money spent is becoming an increasingly important performance measure. Creating a project that generates positive cash flow will service the project's debt obligation, offset declines in other revenue sources, and support the institution's overall planning efforts. By ensuring

<sup>2</sup>Throughout the remainder of this thesis, the author uses the terms, university, college, school and institution of higher education interchangeably to connote a U.S., four-year public college.

that students have a positive, meaningful and affordable experience as they create their own sense of place in the new residence hall facility, the asset manager can contribute to the development of a sustainable campus learning environment.

### 1.3 Importance of this Research

The growth in demand for public higher education will drive the need for new student housing through 2020. Hussar and Bailey (2011) used Department of Education figures to project the total enrollment of 18-24 year olds in post-secondary schools to be 13.1 million by 2020. Assuming that the need for on-campus housing will be greatest for this age range, this researcher estimates that approximately 500 new dormitories will be needed to accommodate just the growth alone (i.e., 1.0 million students) through 2020<sup>3</sup>, not to mention the new construction required to replace retired facilities.

At an estimated cost of \$33.8 million per facility<sup>4</sup>, this researcher conservatively projects that \$16 - 17 billion in capital spending could be required by colleges nationwide to construct new student housing facilities through 2020 to meet this expected demand. During a period of fiscal constraint at the institutional level and budget cuts at the federal and state government levels, it is highly likely that PPPs will need to be seriously considered as a procurement option to help provide financing to meet this high demand for new student housing. As a result, it will be important for administrators at U.S.

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<sup>3</sup>This estimate assumes that 25 percent of the increased number of students will be housed on campus (e.g., freshmen) and that the average residence hall will accommodate 500 beds. This does not include the need for new residence halls required to replace retired, outdated facilities. Therefore these estimates for market demand, student housing supply and construction activity could be considered to be conservative.

<sup>4</sup> Estimated new facility cost is the average cost of a new facility per the Baum database (Baum, 2011) which was used as a source for identifying PPP student housing projects for this study.

institutions of higher education to better understand the drivers of success for these arrangements before they commit significantly to this procurement option.

In summary, reform in higher education is driven by a growth in demand and the countervailing growth in the cost of educating a college student. These two trends appear irreconcilable without some type of intervention. PPPs are one such intervention that university administrators can implement. This research considers whether or not by using PPPs to develop and operate new residence halls and to replace existing facilities, public universities can meet the demand for student housing more effectively. Future research will examine how the use of PPPs might translate into a more cost-effective use of public resources.

In theory, shortening project completion time will increase a project's value. A fundamental precept of modern finance theory, the time value of money, when applied to capital budgeting, suggests that the value of a project will increase as the time between project commencement and the receipt of cash flow is reduced (Titman, Keown, & Martin, 2011). Alternatively, for a given target value, shortening project completion time should result in lower cost. As America's competitiveness remains dependent on an increasingly more educated population, innovative contract procurement methods such as PPPs promise to become more attractive as options to help campus administrators better manage their portfolios of student housing facilities in order to meet growing demand.

#### 1.4 Research Questions

This research proposes to explain the effect of the choice of contract procurement method (i.e., a PPP or the traditional procurement process) on the length of time required to complete a new student housing project at a public university. It is of particular interest to determine (1) whether or not a state's higher education governance structure also has an effect on project completion time and (2) whether or not the existence of a student housing plan, (a proxy for the existence of a professional asset management environment), has any similar effect. The study also seeks to determine the degree to which the relationship between the choice of contract procurement method and project completion time is affected by the state's higher education regulatory structure and/or the existence of a student housing plan at the sponsoring university. The study's findings are based on an analysis of 43 projects where 30 percent are PPPs, 58 percent are subject to a procurement process where state regulators have budgetary approval authority over university-level capital projects and where 33 percent have been initiated as part of a student housing plan, as distinct from a campus master plan.

One prominent theme in the early literature on state governance in public higher education is the concern that over-regulation might adversely affect decision processes at the institutional (college and university) level (Volkwein, 1987). The history of state governance of higher education parallels the evolution of the universities themselves. From about 1950, the level of centralization in state governance structures increased as the role of state government changed from nurturing the development of new types of institutions to building statewide systems. States took on a more regulatory role to

address new market influences such as the growth of student financial aid with support from new statewide information systems (Richardson, Bracco, Callan, & Finney, 1999). Richardson et al. (1999) found that the performance of state higher education governance systems is influenced by the state policy environment and the overall system design.

A student housing plan is a business plan that provides details on the role of the university's student housing program in the context of the institution's academic mission. The plan includes concrete goals and objectives and defines an operating strategy that includes a marketing plan, a list of program and service offerings, an outline of the fee structures and an assignment of direct and indirect costs in the form of pro forma financial statements, and a plan for the use of reserves for repair and maintenance, major renovation and expansion of capacity. As such, a student housing plan is distinct from a Campus Master Plan or a Capital Improvement Plan.

The University Systems of Georgia (USG) mandates that all public universities that provide student housing must have a student housing plan. See Appendix A for the complete set of guidelines for the development of a USG compliant comprehensive student housing plan. The USG guidelines serve as the operating definition of a student housing plan for the purposes of this research. As stated in the preamble of Section 7.11.7.1 of the USG policy manual:

Each institution that provides, or plans to provide, a residential student program shall develop a student housing comprehensive plan that addresses all facets of the creation, expansion, and operation of the student housing facilities (University System of Georgia, 2011).

The research goals are to:

- Examine the implications of an expanded definition of project duration for new student housing projects by constructing a model that explicitly defines how the variables that characterize a project, the institution of higher education and the state regulatory environment impact the relationship between contract procurement method and project completion time;
- Examine how these factors interact and consider how they might impact the university's policy objectives of serving the needs of its student body through meeting the demand for on-campus housing.

To reach these goals, the research strategy is to:

1. Conduct an exhaustive literature review focused on public-private partnerships in the U.S., specifically as they have been used in the development of student housing at public universities;
2. Collect project related data from U.S. land-grant colleges to obtain a statistically representative sample of this group's experience with public-private partnerships in the development of on-campus student housing;
3. Examine the interactions between the choice of using a PPP as the procurement method, the type of state regulatory environment and the use of a student housing plan in terms of their effect on project completion time;

4. Provide a conclusion that synthesizes the aforementioned research and addresses the problems confronting future student housing development at public universities in the United States.

The research questions to be addressed in this study are as follows:

1. To what extent does the use of a PPP as a contract procurement method affect the completion time for a new, on-campus student housing development project?
2. To what extent does the state regulatory policy environment affect the completion time for a new, on-campus student housing project?
3. To what extent does the fact that an institution of higher education has a student housing plan affect the completion time for a new, on-campus student housing project?
4. How do these three important variables (CPM, RegStat and Plan) as well as additional institutional and project specific intervening variables work in combination to affect project completion time?
5. To what extent is the use of PPPs related to an increase in project efficiency?

### 1.5 Contributions of This Study

This thesis makes four key contributions in the areas of modeling the economic impact of public-private partnerships. The research introduces to the literature a new measure of project duration, Project Completion Time, which is the primary dependent variable used in the quantitative model. The methodology used expands the analysis of



project performance beyond an examination of site-level attributes to include institutional and regulatory factors that might influence the completion of a residence hall project. The study also quantifies the impact of state regulation of higher education on student housing transactions. In doing so, it introduces a new intervening variable which will be referred to as “Regulatory Status” (or RegStat). The study also isolates the effect of formalized planning for student housing at the institutional level. Lastly, the study introduces to the literature a second new dependent variable that measures developer efficiency (Speed). A brief background to these four areas is provided below.

#### 1.5.1 The Economic Impact of Public-Private Partnerships

The least squares regression model constructed for this research measures PPP success from the perspective of total elapsed time to complete a project. While the construction management literature (Atkinson, 1999; Belassi & Tukel, 1996; Chan & Chan, 2004) recognizes schedule duration as a measure of project performance, this research is the first to consider the time consumed by the regulatory approval process in the evaluation of project completion time. The PPP literature (Grimsey & Lewis, 2005; Hodge & Greve, 2009) suggests that projects controlled by a PPP entity will be more efficient than those controlled by a government agency. When considering only the construction period, this difference may vary to the extent that the PPP uses different materials (e.g., steel frame versus wood) or construction delivery methods (e.g., Design-Bid-Build versus Design-Build). However, this research considers whether or not efficiencies garnered at the project level are off-set or supplemented by the interactive

effects of the state higher education regulatory environment and institutional-level planning as they impact the relationship between contract procurement method and project completion time.

### 1.5.2 State Higher Education Regulation

The influence of state regulation on capital projects at the level of the state college campus is an under-researched area in real estate. This thesis examines the extent to which regulatory practices impair a school's ability to compete in an increasingly competitive academic market. The results of this research may have implications for the future design of state regulatory systems. To the extent that a university's compliance with existing state regulations creates disutilities at the institutional level, this may preclude a university's ability to use its resources efficiently and diminish its ability to serve its student population. The study introduces the concept of Regulatory Drag which represents the adverse effect that the regulatory environment can have on project completion time. The dynamics of this concept will be explored in future research.

### 1.5.3 Student Housing Plans

This research also examines whether or not a university benefits from having a student housing plan. The impact of having a plan is evaluated in the context of the project completion time (a measure of project duration) and the project speed (a measure of construction efficiency) of a student housing project. For the purpose of this study, the existence of a student housing plan is evidence of a university's adoption of a high

standard in its approach to the management of its student housing assets. The research builds on a limited literature to assess the impact of this asset management tool in the large public university setting.

#### 1.5.4 Introduction of Three New Variables to the Literature

The research adds three new variables to the literature: Project Completion Time, Project Completion Speed and Regulatory Status. Project Completion Time is a measure of project duration, as determined by the number of days between the approval of a project by the university's board of trustees and its completion. Project Completion Speed is a measure of project efficiency and is represented by the number of gross square feet completed per day. Both of these variables may be affected by Regulatory Status, which is characterized by whether or not a state's higher education regulatory regime has budget approval authority over capital projects at the university-level.

#### 1.5.5 Time Value of Service

The study introduces the concept of Time Value of Service as a measure of a public project's performance as determined by its social impact. As a new tool for making capital budgeting decisions, this concept is intended to complement the financial management literature. The concept of Time Value of Service is based on the presumption that a public project should be valued by both financial and social measures. This study considers timeliness as an important measure of the social impact of a service provided by the public sector. The author herein coins the phrase "a service rendered more quickly is a service rendered more valuable." The dependent variable Project

Completion Time has both a financial and social relevance for the public university and its stakeholders. Both the financial and social components of this variable will be examined in future research.

## 1.6 Organization of the Dissertation

This study examines the changing face of the development process for student housing at public universities. It considers the impact of public-private partnerships (PPPs) (a significant market-type mechanism for building, financing and managing infrastructure assets) on creating public value. A key premise of this research is that public value (as determined by financial and social measures) is created by decreasing the time required to complete a new university-sponsored residence hall project.

Chapter Two provides a review of the literature. Its respective sections consider (1) the mechanics of the PPP transaction, (2) the theoretical framework from which current evaluation models have evolved, (3) the planning context within which decisions to use PPPs are applied and (4) performance measures against which projects can be evaluated. The discussion on performance measurement builds on the construction science, public value, university administration and corporate asset management literatures, respectively.

The remaining four chapters are summarized as follows: Chapter Three details the research methodology, including the research design strategy and data-collection techniques; Chapter Four describes the data and the analytical techniques used, then, provides an overview of the research findings; Chapter Five offers a case study analysis

that provides qualitative insights into the nature of the policy issues faced by state universities and establishes a basis for strengthening the external validity of the quantitative findings; and Chapter Six offers the conclusions from the research with consideration of its limitations and also discusses the potential for future research.

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 Introduction

This literature review considers major contributions from the fields of real estate development, planning, finance and public policy. Insights drawn from these disciplines serve as the foundation for a new framework (see conceptual framework on p. 105) for evaluating project performance that is more comprehensive, and to some degree, more pragmatic, than those offered in previous studies.

Section 2.2 addresses the economic issues and public policy effects caused by the decision to use PPPs as an infrastructure asset management tool. The section covers the mechanics of PPP transactions and the impact that they have on project cost, risk and operational efficiencies compared to traditional contract procurement methods.

Section 2.3 explores some theoretical contexts for evaluating public-private partnerships. For example, from a classical economic perspective, the need for PPPs is evidence of the failure of government to invest in public infrastructure in a manner that makes the best use of the taxpayers' dollars. At the same time, public choice theory suggests that new performance measures and incentives are needed to help guide policy makers to make better decisions and avoid potential principal-agent problems.<sup>5</sup>

Section 2.4 examines the general planning environment at state colleges as it relates to student housing projects. The planning literature includes contributions on the

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<sup>5</sup> For example, the implementation of state legislation is open to interpretation at the government agency level where it is implemented. This creates opportunities for the bureaucrat-as-agent to deviate from the intentions of the law.

evolution of university foundations. It provides insights into the nature of governance and administrative structures at public institutions of higher education.

The remaining sections are summarized as follows: Section 2.5 identifies measures from the construction management literature that might be applied as general performance criteria for PPP projects; Section 2.6 considers PPP performance in a public value context; Section 2.7 examines the practical issues related to the administration of student housing facilities at public universities; Section 2.8 explores the implications of student housing when viewed from a public infrastructure and corporate asset perspective, respectively; and Section 2.9 provides a conclusion of the findings from the literature review.

## 2.2 The Economics of Public-Private Partnerships

The International Monetary Fund (2004) defines public-private partnerships as:

- Arrangements where the private sector supplies infrastructure assets and services that traditionally have been provided by the government. PPPs are involved in a wide range of social and economic infrastructure projects, but they are mainly used to build and operate hospitals, schools, prisons, roads, bridges and tunnels, light rail networks, air traffic control systems and water and sanitation plants.
- Attractive to both the government and the private sector. For the government, private financing can support increased infrastructure investment without immediately adding to government borrowing and

debt, and can be a source of government revenue. At the same time, better management in the private sector and its capacity to innovate can lead to increased efficiency. This in turn should translate into a combination of better quality and lower cost services. For the private sector, PPPs present business opportunities in areas from which it was in many cases previously excluded (p.4).

The Canadian Council for Public-Private Partnerships (CCPPP) defines a PPP as “a cooperative venture between the public and private sectors, built on the expertise of each partner, that best meets clearly defined public needs through the appropriate allocation of resources, risks, and rewards” (CCPPP, 2011).

Under the general IMF (2004) definition, the PPPs can assume a broad spectrum of arrangements. However, the typical PPP takes the form of a Design-Build-Finance-Operate (DBFO) agreement<sup>6</sup>. Under a DBFO arrangement, the procuring government agency specifies the services it wants the private sector provider to deliver. Then the private partner designs and builds a dedicated asset for that purpose. The private partner also finances the project’s construction, and subsequently operates the completed asset, collecting user fees for the services provided. This business model contrasts with traditional public infrastructure investment where a government agency contracts with a private developer to build an asset after a competitive bidding process. Under this traditional scenario, the government agency provides the design (contracted under a

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<sup>6</sup> IMF literature cites the following as variants of the DBFO scheme: Build-Own-Operate (BOO), Build-Develop-Operate (BDO) and Design-Construct-Manage-Finance (DCMF) (IMF, 2004, p. 8.)



separate competitive bidding process) and project financing. In most cases, the government then operates the asset once it is built.

The DBFO arrangement reflects the belief that giving the private developer the combined responsibility for the design, building, financing, and operation of a public infrastructure asset will generate efficiencies during the project's development stage and during the service delivery lifecycle. The assumption is that the public will benefit from these efficiencies because they will result in lower user fees (or taxes). This research uses the DBFO model as its operating definition of a public-private partnership with the assumption that the completed asset will be transferred back to the procuring government entity when the operating agreement expires.

A government agency can choose to build a new infrastructure project by using its traditional contract procurement method or by using a PPP. The traditional infrastructure project (i.e., no PPP used) involves a large initial upfront investment to create the asset, and payment of operational and maintenance costs (O&M) over the life of the project. Total O&M expenditures over the life of the asset can be as high as 300 percent of the original capital investment (Kaganova, 2011). Under this typical scenario, a government agency incurs the risk of project budget and schedule overruns, even though it may have outsourced construction services to a private developer.

In addition, most state procurement organizations prefer the Design-Bid-Build<sup>7</sup> construction delivery method as a way to ensure that they obtain the lowest qualified bid.

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<sup>7</sup> Design-Bid-Build (DBB) is a project delivery method in which the project owner enters into a contract with an architecture/engineering (A&E) firm to provide design services based on the requirements provided by the owner. The A&E deliverables include plans and specifications for the construction of the project.

However, there is evidence that this construction delivery method tends to generate more litigation than other types of arrangements (e.g., Design-Build<sup>8</sup>, CMR<sup>9</sup>, etc.) (J. White, personal communication on March 28, 2011). Moreover, the procuring government agency is usually responsible for operating the facility (e.g., residence hall) over its useful life. If the repayment of debt service is dependent on user fees, this results in market risk exposure if the anticipated number of users is not realized. For example, in the case of a student residence hall, students may not enroll, or, if they do, they may choose not to live on campus.

In a PPP project (e.g., Design-Build-Finance-Operate) arrangement, the procuring government entity specifies the services it wants its private sector partner to deliver. Thereafter, the private entity designs and builds a dedicated asset for that purpose. A group of private investors finances and manages the construction of the project, then maintains and operates the facility for a typical period of 20 to 30 years under a single

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These documents are subsequently used by the owner as the basis for a separate contract with a construction company. The most common approach to choosing a construction contractor is to solicit competitive bids from different companies on the basis of their response to these documents. The company providing the lowest qualified bid will then build the project according to the documents produced by the A&E firm. As a result of this process, two separate contracts, with two separate entities, requiring two solicitations and procurement steps, are utilized by government owners to complete one construction project (Hale et al., 2009).

<sup>8</sup> Design-Build (DB) is a project delivery method wherein the owner provides requirements for the specified project and awards a contract to one company that designs and builds the project. Therefore, there is only one procurement step, one contract between the owner and the developer (which performs the A&E function) and one entity involved in the completion of the project (Hale et al., 2009).

<sup>9</sup> Under a Construction Manager at Risk (CMR) project delivery method, there are three prime players: the owner, the designer and the builder. There are two separate contracts: between the owner and designer and between the owner and builder. CMR differs from DBB in that the project phases overlap as the contractor (construction manager) is selected during the design phase as a representative of the owner's interest to provide preconstruction services. Therefore, the selection of the construction contract is based on aspects other than total cost. Certain risks normally assigned to owners in DBB are transferred by contract to the CMR contractor, the premise being that the contractor's involvement during design should allow the firm to assume more risk than in DBB. This risk may include change order costs due to bid exclusions, design errors and omissions, regulatory agency issues, and price inflation (Rojas & Kell, 2008).

long-term contract. Bundling project construction and operation generates incentives to design the project so that it minimizes life cycle costs and complies with enforceable service standards. Most production processes are typically subcontracted to a network of special service providers (e.g., general contractor, sub-contractors, maintenance contractors, food service providers, etc.). Under the PPP arrangement, the procuring government agency is able to use private rather than public funds and transfer finance, construction, operating and marketing risks to a third party, private sector partner, yet still deliver the benefits of a new public infrastructure asset to its constituents.

The increase in the use of public-private partnerships in the construction of public infrastructure over the past two decades is attributable to the success of the stand-alone project financing structures used globally to develop large (often in the \$1 billion range), new energy-related facilities and mineral extraction projects. The specifics of project finance are well suited to the basic economics of PPP projects (e.g., student housing projects) which tend to be considerably smaller in scale (Engle et al., 2010).

Figure 2.1 presents a graphic overview of the typical PPP arrangement. Under the PPP model, the obligations of the private partners to a sponsoring government agency with regard to an infrastructure project are typically executed through a Special Purpose Vehicle (SPV). The SPV is an independent business entity that serves as the locus for a web of contracts with a variety of stakeholders. Contracts might include agreements with the procuring government authority, the users of the services provided, the building and operations contractors, debt holders and the investors in the project. After project completion, the SPV receives a stream of payments as compensation for providing the

contracted services and taking on the risk associated with the development and management of the project. These payments cover the amortization of the debt incurred on the initial investment, the operation and maintenance expenses, as well as a return on the investment for the investors. Cash flows generated from these payments come from user fees, such as residence hall bed rental payments, or payments by the government procuring authority. At the end of the contract, the SPV transfers the assets to the sponsoring government agency (Engel et al., 2010).

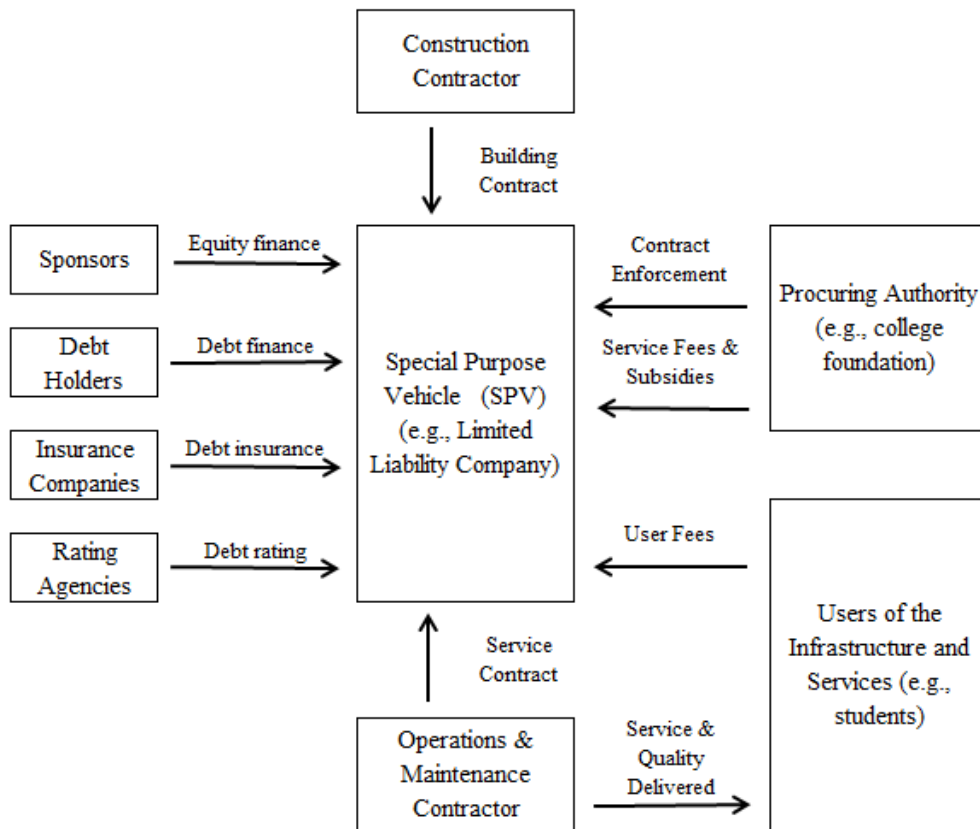


Figure 2.1 Graphic Overview of Typical PPP Arrangement (Adapted from Engel et al., 2010, p.46)

In the context of a student housing project, the procuring authority would be a state university or an affiliated foundation. The special purpose vehicle is typically a limited liability company (LLC) that is owned either by a group of private investors or by the foundation. The LLC raises money for the project from equity investors and/or by issuing bonds. The LLC will then employ an architect and general contractor to design and build the facility, and operations and maintenance contractors supply ongoing services (e.g., custodial, property management, food, etc.) after building construction is complete. Students will pay room and board to the operations contractor, who will in turn, transfer these fees to the LLC.

As an asset management tool, PPPs can provide a variety of benefits. It is important for politicians and procuring government agencies to understand the circumstances under which PPPs are the best project delivery choice. Hodge and Greve (2010) offer several levels at which to evaluate PPP performance over time. At the level of overall state fiscal health, the procuring agency and/or its central governing authority may have concerns regarding debt levels which influence the state's credit rating and cost of financing. A PPP arrangement may make sense as a way to circumvent budget constraints or existing bond covenants. The private financing component of PPPs can provide a way for a procuring agency to provide infrastructure without increasing public sector leverage ratios<sup>10</sup> (Hodge & Greve, 2010). The ability to obtain off-balance sheet financing can be especially attractive to government agencies that need to replace aging

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<sup>10</sup> Debt ratios can be calculated in a number of ways. In general, this is represented by the amount of debt outstanding divided by the value of total assets as shown on the government agency's balance sheet.

infrastructure, but face budget deficits and resistance from citizens to the prospect of paying higher taxes.

Other PPP measurable benefits include: (1) the ability to reduce operating expenditures through the capture of operating efficiencies introduced by the private provision of products or services; (2) better value-for-money for the taxpayer; (3) better accountability (e.g., pricing and service levels are spelled out in contracts); (4) improved business confidence; (5) better on-time and (6) on-budget delivery of the asset; (7) higher levels of innovation; and (8) increased customer responsiveness (Hodge & Greve, 2010).

Table 2.1 provides a list of measurable benefits that could accrue to an agency sponsoring a PPP arrangement and a justification for why they might be anticipated. A comprehensive project management process might include contract language that refers to each of these factors with specific performance targets.

<b>Performance Factor</b>	<b>Justification</b>
Off-balance sheet financing	Public entity able to access private financing for infrastructure without incurring the financial risk.
Reduce pressure on public sector budget	By capturing operational efficiency of private sector provider, the public agency is able to lower its operating costs.
Better value-for-money for taxpayer	Value-for-money is the ability to achieve the optimum combination of lowest whole-life costs and highest asset quality to meet the user's requirements. This is achieved when the net present value of future cash flows from the project, discounted at the government's cost of capital, is higher than similar cash flows estimated from the government provisioning alternative (i.e., public sector comparator).
Better accountability	Because of the contractual nature of the PPP, it is presumed that there is greater transparency regarding the performance of the private sector provider vs. the public sector.
Improved business confidence	Because project risk is placed with the party best able to bear it, the business community (the financial and construction community in particular) should respond more favorably to the agency.
Better on-time and on-budget delivery	Because of contractual incentives and penalties, the private partner is motivated to deliver the project on time and on budget.
Higher level of innovation	The private provider is incented to incorporate innovations more readily because the firm will capture more profits through greater efficiencies.
Increased customer responsiveness	Increased responsiveness results from the fact that there is less bureaucracy involved in approval processes as decision-makers are closer to the customer, and the provider is incented by the profit motive to provide quality service.

Table 2.1: PPP Performance Factors (as adapted from Hodge & Greve, 2010, pp. S11-12)

From a social welfare perspective, there are several reasons why it might be preferable for a PPP to build a public infrastructure asset rather than a government agency. First, since the same firm builds and operates the project under a PPP, it has incentives to consider life cycle cost during the construction phase. These incentives are

not present under public provision, since numerous, unrelated parties might be involved with little incentive to implement a whole-life project strategy. When service quality is contractible, bundling of construction and operations provides an argument in favor of PPPs (Engel et al., 2008). A second argument in favor of PPPs is that since the private firm owns and operates the infrastructure asset over a significant portion of its life, private partners have incentives to manage risk more effectively than public providers. The private provider is encouraged by the profit motive to create more innovative, cost-saving solutions, in contrast to the public provider, who may have to negotiate the implementation of such innovations with regulators, politicians and administrators within central authorities. A third argument in favor of PPPs is that the private partner is typically compensated through user fees rather than via government transfers (Engel et al., 2008), therein minimizing the financial impact on taxpayers.

Kaganova and Polen (2006) provide a comprehensive review of the potential benefits of PPPs in the development of public infrastructure. These include potential financial benefits through revenue sharing arrangements, more appropriate risk allocation, greater quality control through output-based performance management, protection from politically-driven under-investment provided by long-term contracts, increased efficiency (and subsequent cost savings) at all stages of the real estate life cycle and more productive use of those assets that cannot be fully privatized.

Another potential benefit that government agencies can derive from the use of PPP arrangements includes a higher level of operational transparency. PPPs can provide the procuring agency with a better understanding of the total costs of providing the



required service than might normally be available. The public sector client can clearly define the service it requires, and the private sector partner can give a concise price for the total provisioning of that service – covering up-front investment, recurring costs and profit. This helps to avoid short-termism by focusing all parties' attention on the long-term needs of the procuring agency and the constituents served.

Public-private partnerships are not necessarily a panacea for a state or local government's fiscal woes. A public agency's access to off-balance sheet financing may not necessarily serve the best interest of those stakeholders who ultimately pay for the services provided. Stakeholders might include the users of the infrastructure who pay for the services through user fees and/or the taxpayers, in the event that user fees do not cover the true cost of providing the service. Kaganova and Polen (2006) indicate that much of the initial enthusiasm for Britain's Private Finance Initiative (PFI) came from the hope that the inflow of private investment would solve the problem of accumulated under-investment in public infrastructure that resulted from public budget constraints (financial benefits). There was also a perception that the PFI would deliver public-use assets without increasing government borrowing (fiscal benefits). However, the "off-balance sheet" accounting treatment was challenged by the Accounting Standards Board (Broadbent, et al. 2001) and this second justification soon fell apart.

In the U.K., the public sector ultimately pays for PFI investments through annual government agency payments to the private-sector partner under long-term lease arrangements. As a result, it was soon apparent that what was purely a question of

accounting (i.e., Where should costs and debt be recognized?) did not constitute an economic rationale for PPPs (Kaganova & Polen, 2006).

Also, it should not be taken for granted that PPPs are more efficient than direct government investment and supply of services. As in any business sector, PPPs have been known to fail because of poor management and illiquidity. Another concern is that PPPs can be used to bypass spending controls, move public investment from budget oversight and to remove debt from the public balance sheet just to improve the entity's credit rating. These motives are cosmetic in nature because the government agency still bears most of the financial risk involved and faces potentially large fiscal costs (IMF, 2004).

Shaoul (2005) refers to a number of failed Private Finance Initiative (PFI) projects in the U.K. as evidence of what can go wrong with PPPs. He found that value-for-money appraisal methodologies were often biased in favor of PFI policy expansion. He also notes that a number of PFI projects were changed to make them more acceptable to planners (Shaoul, 2005). In the U.K., PFI financing costs were between 2.5 and 4 percent higher than rates available for publicly-financed school projects (also known as the PPP premium). However, this difference in financing costs was seldom included in the value-for-money calculation of PFI projects (Hodge & Greve, 2010).

Flinders (2005) sees PPPs in the U.K. as a “buy now, pay later” scheme, wherein the political incentives of high voter acquiescence, quicker promised delivery of infrastructure and more positive relationships with the financial services and construction industries drive politicians to prefer PPPs to the possible detriment of the taxpayer.

Further, he invokes the comparison of PPPs to a “Faustian bargain” whereby the British government may have traded the debatable results of PPPs for a doubtful future. Flinders (2005) purports that PPPs “...change the focus of attention to the needs of the firm, the contractor and the “consumer” rather than some wider notion of the public interest” (p. 28).

Kaganova and Polen (2006) identify several additional potential pitfalls faced by PPPs. These include high transaction costs, the risk that management costs outweigh the project’s benefits, higher financing costs, potential constraints caused by long-term arrangements and political concerns. Transaction costs may include the cost of hiring consultants to help define output/outcome measures, perform feasibility studies that take into account both private and public sector costs/interest, identify risks and liabilities that the private sector will be asked to take on, prepare the RFP and negotiate the contract, among other duties. For example, PPPs in the UK that involve private financing are not recommended for single projects with a capital value under £20 million because the costs of managing the procurement process alone are likely to exceed the potential benefits. Secondly, the cost of managing the contract once in place may be high. The contract administration expense may include the costs of monitoring performance indicators, assessing penalties if necessary, managing whatever flexibilities are built into the contract and negotiating adjustments over the lifetime of the contract. The financing costs of PPPs are likely to be higher where the private sector partner secures some or all of the financing. The financial markets typically impose a risk premium on private sector borrowers. Long-term contracts can be a boon or a bane. For agreements that require a

high degree of flexibility over time, long-term contracts may be too restrictive. Conversely, if they are designed to be sufficiently flexible, they may fail to deliver the benefits of life cycle costing and cost certainty (Kaganova & Polen, 2006).

Lastly, political concerns may pose barriers to establishing a PPP arrangement. Some risks are not transferable such as the risk of failure in delivering the service associated with the property supplied through a PPP. Politicians associated with a failed project could lose public support. Other politically sensitive issues may include: (1) lost jobs or (2) jobs moved from the public to the private sector where employees may have fewer benefits, (3) excessive profit earned by the private sector and (4) a lack of transparency in the procurement process.

The effective transfer of risk is a key distinguishing feature of the PPP concept from the traditional government procurement method. Even under a normal outsourcing contract, the government agency is still responsible for the outcomes of the services delivered (e.g., timing, quantity, quality, cost, etc.), even though a third party might actually do the work. However, under a PPP, construction risk, availability risk and demand risk can be effectively shared and ultimately off-loaded onto the private investor. Construction risk involves events such as late delivery, cost overruns, and deficiencies with regard to functionality. Availability risk involves the failure to deliver the service at the level contractually agreed upon or within the safety parameters specified by public certification standards relating final users. It also applies where the partner does not meet the specified quality standards relating to the delivery of the product or service. Demand risk involves circumstances whereby there are fewer users than expected when the

contract was signed regardless of what the private partner did or could have done. This risk can result from factors such as the business cycle, new market trends, direct competition and, or technological obsolescence (Blondal, 2005). At the end of the day, the private partner bears the burden of providing the service, whether or not the projected demand is realized.

Government guarantees provided in connection with PPPs can be a major source of fiscal risk to the sponsoring agency. The risks incurred by the private sector in connection with PPPs can be reduced or eliminated through explicit government guarantees. Most commonly in connection with PPPs, the project's financing risk can be reduced through a loan guarantee, demand risk through guaranteed minimum payments for services sold to the public, and residual value risk by the government guaranteeing the price at which it will purchase an asset when the operating contract ends (Brix and Schick, 2002).

PPPs have been used effectively to mitigate political risk. Hodge and Greve (2010) note that government agencies around the world have been able to complete projects through PPPs that their political predecessors had been unable to complete. Bundled infrastructure contracts (e.g., multi-site, multi-financial partners) for large consortia are considered state-of-the art in terms of project finance and management. They have also enabled state agencies to cut through traditional planning blockages. Indeed, a new governance tool with stronger leverage appears to have evolved. However, there is evidence of real governance shortfalls which PPP advocates have failed to acknowledge. Hodge and Greve (2010) point out that "to the extent that new

infrastructure contract delivery arrangements have reduced existing accountability arrangements and altered longstanding governance assumptions with little democratic debate, new partnership arrangements lack legitimacy” (p. S17).

### 2.3 Theoretical Framework

Privatization and related market theories of public management have their advocates and detractors. Advocates support market mechanisms as a response to the perceived failure by government to meet economic and organizational efficiency expectations. Savas (2000) identifies five primary influencers that enhance the attractiveness of privatization. They range from pragmatic to populist sentiments. Table 2.2 lists his descriptions of these influencers and the reasoning behind them.

When the cost of government services is increasing but the public’s resistance to higher taxes is also rising, public officials seek administrative options that either curtail spending, cut services or increase agency productivity. In light of the popular resistance to cutting services<sup>11</sup> public-private partnerships have evolved as a credible option for increasing government efficiency. The thinking here is that by invoking the power of private property rights, market forces and competition, consumers will be able to get more for their money. For the purposes of this study, the stakeholders for whom the ultimate benefits from the use of PPPs will be measured are students at U.S. public universities.

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<sup>11</sup> For example, because of the growing student demand for higher education in California, recent proposals to cut admission rates in California’s state college system has been immensely unpopular with students and faculty (Rivera, 2012).

<b>Influence</b>	<b>Effect</b>	<b>Reasoning</b>
Pragmatic	Better government	<ul style="list-style-type: none"> <li>• Prudent privatization leads to more cost-effective public services.</li> </ul>
Economic	Less dependence on government	<ul style="list-style-type: none"> <li>• Growing affluence allows more people to provide for their own needs, making them more receptive to privatization.</li> </ul>
Ideological	Less government	<ul style="list-style-type: none"> <li>• Government is too big, too powerful and too intrusive in people's lives and is therefore a danger to democracy.</li> <li>• Government's political decisions are inherently less trustworthy than free-market decisions.</li> <li>• Privatization reduces government's role.</li> </ul>
Commercial	More business opportunities	<ul style="list-style-type: none"> <li>• Government spending is too large a part of the economy; more of it can and should be directed towards private firms.</li> <li>• State-owned enterprises and assets can be put to better use by the private sector.</li> </ul>
Populist	Better society	<ul style="list-style-type: none"> <li>• People should have more choice in public services.</li> <li>• People should be empowered to define and address common needs, and to establish a sense of community by relying less on distant bureaucratic structures and more on family, neighborhood, church and ethnic and voluntary associations.</li> </ul>

Table 2.2: The Influences Promoting Privatization (as adapted from E.S. Savas, 2000, p.6)

Detractors of public-private partnerships suggest that the public sector should always provide public goods to avoid the risk of market failures. Market failures are scenarios where the pursuit by individuals' of their own self-interest tends to lead to results that are detrimental to the overall well-being of society (e.g., monopolies) or when transaction costs are so high that potential participants are discouraged from participating (e.g., the provision of public education) (Arrow, K., 1969).

Outsourced government services can exhibit many of these same market failures (de Leon & Denhardt, 2000; Lowery, 1998). Lowery (1998) explains that quasi-markets (a catch-all for the range of privatization options) can fail as the result of a lack of market formation, as in the case of natural monopolies. When government services are outsourced to private providers, consumer sovereignty, which, in the context of public choice theory, provides the ultimate yardstick of public policy performance, is no longer meaningful. As a result, with no competition, the private contractor has no incentive to improve the efficiency or quality of the services delivered. He also notes that quasi-markets can fail and consumer sovereignty can be undermined where consumers lack sufficient information to make choices that would reflect their true preferences, also known as “preference error” (Lowery, 1998).

Neoclassical theory provides a general rationale for market failures and provides a logic that supports government intervention. It uses a similar logic to help us understand non-market failures and the need for market-type mechanisms like PPPs. Neoclassical economics justifies government provision of services as a result of market failure. The literature cites “spillovers” from economic activities, either benefits or costs that are not respectively receivable or payable by the private producer, as causing market outcomes that are not (Pareto) efficient. Since these external benefits or costs do not normally enter into the calculations on which production decisions are based, too little output will tend to be produced where the externalities are net benefits, and too much where they are net costs, compared with socially efficient output levels (Wolf, 1978). As mentioned earlier, public education is an example of a positive externality (benefit) which provides a



rationale for government intervention to compensate for the market's tendency to produce an insufficient level of output.

For a number of reasons, non-market solutions to market failures may themselves fail. Incentives influencing the behavior of government agencies may lead to outcomes that diverge from what is socially preferable. Wolf (1978) notes that just as the absence of certain market mechanisms create market failure, so too, non-market failures result from the absence of non-market mechanisms to reconcile calculations by government decision-makers of their organization's private costs and benefits with total costs and benefits to society. Public policies often result in non-market failure for several reasons: (1) outputs are hard to define and difficult to measure; (2) quality is difficult to monitor because of a lack of consumer feedback; and (3) non-market output lacks "bottom-line" objectives for evaluating performance. One focus of this research is to examine the effect of non-market failure in the regulation of higher education as reflected in the preference at some state schools to use PPPs as a contract procurement method for student housing.

A key objective of this research is to determine the extent to which the use of PPPs as a contract procurement method for new student housing projects at public universities is related to non-market failures, or "over-regulation," in state government. Because of the growth in the complexity and political nature of the capital budget approval process, a key premise is that many public universities are increasingly turning to PPPs as a way to circumvent state procurement regulations in order to better satisfy the demand for student housing.

Figure 2.2 shows the growth in non-recourse financed student housing projects (PPPs) since 1995 (Baum, 2011). The numbers reflect rapid growth in the early 2000's driven by the perceived benefits of off-balance sheet financing. The numbers dropped in the late 1990's as bond financing became more difficult to obtain. However, the overall trend shows an increase in the number of transactions.

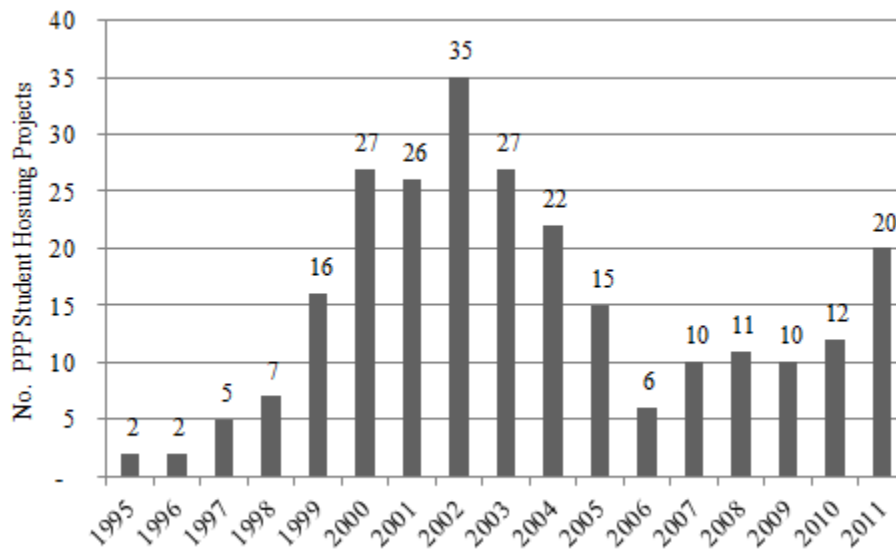


Figure 2.2: Number of PPP Student Housing Projects by Year Financed 1995-2011 (as adapted from Baum, 2012 using author's calculations)

A theoretical framework is needed which gets beyond the market failure versus government failure dichotomy and explores the full range of components in the public service delivery decision (Zebre & McCurdy, 1999). This study provides a new, broader framework that serves as a context for choosing between alternative contract procurement methods.

The general debate on privatization has been highly ideological, relying primarily on case studies. Whereas, proponents have found that PPP arrangements lead to cost

saving efficiencies and quality improvements (Eggers & O’Leary, 1995; Savas, 2000), detractors point to cost overruns, corruption, and the erosion in citizen voice as an end result of PPP use (Hebdon, 1995; Sclar, 2000; Starr, 1988). Several empirical analyses led to mixed economic support for using PPPs to achieve public goals through the construction of economic and social infrastructure projects (Hodge & Greve, 2009). However, the debate remains dominated by public choice theory and has rarely addressed the dynamic and mixed (public and private) nature of local government service delivery (Boyne, 2002).

Figure 2.4 provides an overview of the leading theories related to the economics of the firm. The stems that are most relevant to the study of PPP arrangements are along the Contractual (Institutional) branch. The other branch represented by Neoclassical economic theory focuses on the firm as having similar characteristics as consumers, in that it tries to optimize the potential benefits of production choices just as the rational consumer seeks to optimize his or her consumption choices.

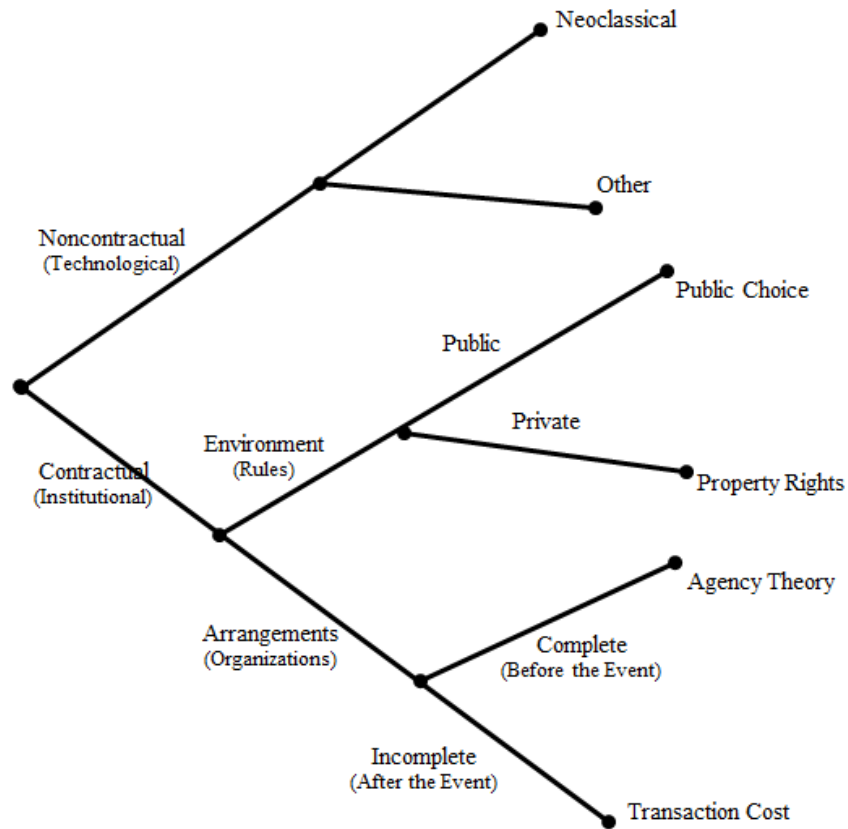


Figure 2.3: Economic Theories of the Firm (as adapted from Williamson, 1990, p. 62)

However, this non-Contractual, Neoclassical theory is limited in its ability to address more complicated questions such as: (1) What factors are principally responsible for the decision of a firm to produce to its own needs rather than buy a good or service, e.g., when should a university build its own residential halls versus outsource?; (2) Why do bureaucratic costs arise, e.g., by what mechanisms can universities control costs in order to maintain tuition levels?; (3) What factors are responsible for limitations to firm size, e.g., what are the limits to university facility expansion?; (4) When is franchise bidding for a natural monopoly effective and when is it not, e.g., when is the use of a PPP

appropriate?; and (5) Do debt and equity differ in governance structure respects and why, e.g., does it make a difference if student housing is built with bonds, donor funds, or private equity? (Williamson, 1990).

The New Institutional Economics theory has introduced a contractual-based context for institutional choice which spans the institutional “Environment” and the “Arrangements” stems, respectively. Davis and North (1971) introduced a theory of institutional change that would compensate for the limitations of Neoclassical economic theory by developing a body of theory that would incorporate the “the innovation, mutation and demise of institutions” (Davis & North, 1971). Their definitions of these two contractual stems are as follows:

The institutional environment is the set of fundamental political, social and legal ground rules that establishes the basis for production, exchange and distribution. Rules governing elections, property rights, and the right of contract are examples... An institutional arrangement is an arrangement between economic units that governs the ways in which these units can cooperate and/or compete. It...[can] provide a structure within which its members can cooperate. . .or [it can] provide a mechanism that can effect a change in laws or property rights (pp. 6-7).

The Environment branch (Figure 2.4) is concerned with setting up the rules of the game in both public and private sectors. It is through the mechanism of contracts that institutions such as public universities are able to transfer risk to third party service providers in PPP arrangements and monitor performance against expectations.

The public choice literature has developed in response to the first of these (i.e., rules of the game in the public sector). Public Choice Theory is based on the concept of methodological individualism, also known as rational utility maximization (Mitchell, 1989). In their seminal work, “Calculus of Consent,” Buchanan and Tullock (1974) set forth a demand theory of governmental growth, launching the defining arguments for Public Choice Theory. Public Choice Theory argues that policies that allow market-like solutions may replace central planning and improve the efficiency of the political process (Buchanan & Tullock, 1974). Through privatization, private firms compete for public service delivery which may lead to cost savings, higher efficiency, and less government involvement (Domberger & Jensen, 1997; Savas, 2000).

Public Choice Theory presumes that politicians/public servants, like citizens/consumers, pursue their own self-interest, seeking to maximize their own unique utility preferences. The “public interest” is an aggregation of individual consumer preferences. However, several studies of public managers have challenged the self-interest claims of public choice theory and emphasized a professional motivation for public service (DiIulio, 1994; Francois, 2000; Moore, 1995). Some critics of public choice challenge its assumptions regarding the separation of provision from production, the aggregation of individual consumer preferences to achieve the collective public good, and competition as a substitute for planning in local public service markets (Lowery, 1998; Starr, 1988).

A key consideration within the context of Public Choice Theory is how to hire competent individuals within the public sector and create an effective system of oversight

and sanctions to ensure that the public interest is met. Moreover, the question remains regarding how the competent public manager can best represent the public interest. A premise of this research is that facility managers at state universities, as stewards of public assets, can best serve the interest of the citizens of their state by applying best asset management practices, which may entail the use of contract procurement methods such as PPP and strategic tools such as student housing plans. In the context of Public Choice Theory, this approach will serve the dual purposes of maximizing public asset value and furthering the managers' career aspirations.

Alternatively, the Arrangements branch of the Williamson (1990) diagram is concerned with the details of organization (or relationship) structure. Both before-the-fact incentive (ex-ante) alignment (the agency theory node) and after-the-fact governance (the transaction cost node) are applicable to this research. Agency theory maintains that contracts are comprehensive, wherein all of the relevant contracting action is concentrated in the after-the-fact agreement. Contractual incompleteness is characteristic of transaction cost theories of economic organization in which ex post<sup>12</sup> governance is featured (Williamson, 1975; 1990). According to Williamson's analysis, the traditional approach to contracting within the public sector was fundamentally misguided. It led to "confrontational contracting" based on the mutual attempt to take advantage of the other party. He suggested a new partnership-based approach to contracting, in which both parties would benefit from helping each other to be more successful.

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<sup>12</sup> "Ex post" means after the arrangement has been consummated. This is in contrast to governance decisions that would apply before an arrangement is made.

Some scholars have used transaction cost approaches to compare the costs of direct public delivery with the contracting process (Alexander, 2001; Brown & Potoski, 2003; Nelson, 1997). Key questions to consider in future research would be whether it is more expensive to use PPPs or traditional procurement processes for student housing and to what extent does this decision affect the university's overall cost structure.

Transaction cost economics has become a predominant theory of the firm. It prescribes matching certain transaction types with governance structures offering the lowest transaction costs. This might have particular relevance when considering options for overseeing residence hall projects developed and managed through PPP arrangements versus those developed and managed through traditional campus auxiliaries. According to Transaction Cost Theory (TCT), firms are a specific form of organization designed to administer exchanges, or "transactions," between one party and another (Coase, 1937). In this conception of the firm, the firm itself is characterized as a "managerial hierarchy" and is contrasted with other forms of organization, most notably markets, in which transactions take place without managerial oversight (Williamson, 1996). The basic insight provided by the TCT literature is that firms exist because they can sometimes reduce the costs of negotiating and enforcing terms and conditions of exchange (either because of their size creating scale economies or their ability to specialize) relative to market transacting (Coase, 1937). This will be the case especially when uncertainty about future business conditions makes contracts incomplete.

Williamson (1990) notes that:



Transaction cost economics maintains that whether or not property rights can be (1) well-defined and, once defined, can be (2) understood by and (3) effectively enforced by the courts they are all problematic. Indeed, problematic property rights invite the appearance of nonmarket [regulated] modes of organization that have the purpose and effect of providing contractual integrity for transactions that are "deficient" in any or all of these property rights respects (p. 66).

Because of its focus on arrangements between economic units within the institution, Transaction Cost Theory in public organizations combines both individual and organizational behavior to address principal-agent problems in government organization (Williamson, 1996). However, Argyres and Liebeskin (1999) note that an organization's ability to adapt to transaction complexity is limited by a phenomenon they call "governance inseparability." This is a condition in which a firm's past governance structures related to previous transactional choices significantly influence the range and types of governance mechanisms that it can adopt in future periods (Argyres & Liebeskin, 1999). This tendency may impede a government agency's ability to provide the appropriate governance techniques required to manage the complexity introduced through public-private partnerships.

A limitation of Public Choice Theory and Transaction Cost Theory is that the social values inherent in public services such as higher education may not be adequately addressed by the economic efficiency calculus of markets (Kelly, 1998; Starr, 1988). Moreover, the consumer notion of citizenship, as postulated in Public Choice Theory,

does not adequately address the broader social concerns of the citizen (deLeon & Denhardt, 2000). Likewise, public colleges and universities are more than businesses. They reflect collective identity, respond to diversity, and promote social equity (Box, 1999). As a result, increasing attention is being given to the intrinsic value of interaction between citizens and government in the public service delivery process to promote democracy, community building, and a more socially equitable system of urban service provision (Denhardt & Denhardt, 2000; Frug, 1998; Marmolo, 1998; Potapchuck, Crocker & Schechter, 1998).

Denhardt and Denhardt (2001) go on to say:

The spirit of public service extends beyond those formally working for government, those we think of as public servants. Ordinary citizens have also wished to contribute. However, the avenues through which they might bring their many talents to bear have been somewhat limited, in part, we think, because over the past several decades, we have severely constrained the citizenship role, preferring to think of people as customers or consumers rather than citizens (p. 1).

Consequently, and especially in the case of institutions of higher learning, an ideal system of performance measures for a public-private partnership would require a multi-dimensional approach that incorporates both quantitative and qualitative metrics that reflect the economic and social outcomes desired by the institution. Therein lies the case for establishing a framework that exhibits best practices for planning and accountability. The research described in the remaining chapters, has identified an outcome measure

with both social and economic components (Project Completion Time) and examines how it is influenced by both quantitative and qualitative factors.

## 2.4 Planning in Higher Education

### 2.4.1 Overview

The current research builds on the theory of “decision point analysis,” which proposes that a state procured residence hall would take longer to build than when a PPP is used. There are a number of articles in the public policy literature that refer to the problems caused by regulatory externalities (Wolf, 1978; Glenny & Schmidlein, 1983; Hearn & Griswold, 1994). The most salient literature on this issue is a case study by Pressman and Wildavsky (1973). They developed a grounded theory from their case analysis that predicted that delays in government policy implementation will be dependent on the: (1) number of decision points (e.g., administrative sign-offs) required to move a policy toward its stated objective, (2) number and variety of participants at each decision point, (3) preferences, positive or negative, of the participants in regard to the policy under consideration, and (4) participant's preference intensity over time. Based on their hypothesis, the development schedule for a student housing project would be shorter when privately developed than when developed by a public agency.

Public universities serve a complex matrix of stakeholders. However, a state school's capital procurement procedures are directly influenced by the structure of the state regulatory environment. Inefficiencies in the regulatory process and disutilities that might be created by government project approval procedures can affect the ability of a

public university to effectively pursue its mission. As a result, the public university's planning function must be adaptable and continuously improving for it to remain competitive, while allowing it to effectively navigate a changing landscape marked by the fluid nature of its regulatory, governance and management structures.

Table 2.3 lists the typical stakeholders in a public university and their key areas of interest in the institutional outcomes produced. The planning effort within the university environment must address the needs of all stakeholder groups in order to ensure the overall success of the institution. As a result, an evaluation of the choice of whether or not to use a PPP to build a new residence hall should be considered in the context of its impact on all stakeholders' needs. This information was compiled through a series of interviews and email exchanges with 91 people from academia, government and industry. These individuals are listed in Appendix J.

Stakeholders	Key Stakeholder Areas of Interest
Policy Makers	<ul style="list-style-type: none"> <li>• Ensure institution develops in a manner that promotes regional economic development</li> <li>• Create an operating environment that encourages increased student enrollment</li> <li>• Provide opportunity for operational efficiencies and revenue development</li> <li>• Retain a degree of control over campus assets (e.g., capital budget, tuition, level of service, etc.)</li> <li>• Protect existing civil service employees</li> </ul>
University Administrators	<ul style="list-style-type: none"> <li>• Enhance the university's reputation</li> <li>• Attract the best students and faculty</li> <li>• Build campus facilities competitive with peer institutions</li> <li>• Deploy PPPs on a select basis to maximize the value to all stakeholders</li> <li>• Obtain relief from cumbersome public procurement rules and operate more like a business than a unit of government</li> <li>• Promote academic excellence, safety, public service, student support, financial stability</li> <li>• Compliance with laws and regulations</li> <li>• Non-tuition-based revenue development</li> <li>• Operational efficiencies</li> <li>• Labor stability</li> </ul>
Students	<ul style="list-style-type: none"> <li>• Obtain an education that leads to employment</li> <li>• Pay reasonable tuition and room fees that minimize debt burden</li> <li>• Enjoy a safe, supportive environment inside and outside of class</li> </ul>
Investors	<ul style="list-style-type: none"> <li>• Earn a reasonable return on investment commensurate with amount of risk</li> <li>• Seek an appropriate balance between equity and debt to maximize returns</li> <li>• Minimize exposure to political and regulatory risk</li> <li>• Conduct the transaction under a transparent process</li> <li>• Have access to relevant data to conduct due diligence</li> <li>• Provide for a clear and credible timetable for the process</li> <li>• Minimize the transaction costs required to participate</li> </ul>
Private Developers	<ul style="list-style-type: none"> <li>• Promote safety, security and customer service</li> <li>• Maximize their financial return through operating savings, revenue enhancements and high facility utilization</li> <li>• Expedite service delivery relative to public sector rules</li> <li>• Minimize student housing costs to the mutual benefit of the university administration, the developer and the students</li> <li>• Incentivize employees through bonuses, succession programs and training</li> </ul>
Alumni	<ul style="list-style-type: none"> <li>• Ensure the financial, physical and cultural integrity of the institution</li> <li>• Ensure access to college athletic and social activity both on and off campus</li> <li>• Ensure reasonable access to institution for children at affordable rates</li> </ul>

Table 2.3: Key Stakeholders in Public University Outcomes and Their Areas of Interest

Development transactions based on PPP relationships can be tools to help the public institution navigate both the vagaries of regulation as well as the demands of a competitive marketplace. One of the key weaknesses in the literature is the lack of an integrated approach to campus planning that effectively recognizes and supports the interrelatedness of the multiple revenue sources, multiple stakeholders, customized service delivery options and the need for flexible planning strategies.

#### 2.4.2 Emerging Trends for Campus Planners

Perhaps the greatest achievement in public education is America's system of land-grant colleges, around which this research is focused. Created in the Land-grant College Act signed in 1862, the land-grant colleges coalesced many of the reforms of American higher education in the mid-19<sup>th</sup> century. The legislation allotted to each state a share of federal government land, which it was to sell and use the funds to establish colleges for agricultural and mechanical education. Early land-grant colleges shared certain basic goals such as the promotion of practical education, providing the right of education for all social classes and the freedom of students to choose their courses of study (Turner, 1990).

Most of the land-grant colleges share a park-like, suburban, landscape model. Turner (1990) noted that America's first landscape architect, Frederick Law Olmsted, created a model of campus planning that appealed to early land-grant colleges for several reasons. It provided an informal plan to accommodate the unforeseeable future needs of these institutions whose character was not yet fully defined. Moreover, an informal design is inherently appropriate to a land-grant institution as an expression of modest

rural values in contrast to the elitism and formality of the traditional private colleges. The park-like campus model also provided a tangible symbol for the new liberal and democratic ideals of education. See Figure 2.4 for an example of the Olmsted influence at land-grant colleges.



Figure 2.4: Students Attending Class on the Campus of Clemson University, an 1862 Morrill Act land-grant college (Clemson, 2012)

A number of important trends affect the current planning environment at American public universities. Brinkman and Morgan (2010) point to five external forces

that influence the funding environment. These include: (1) shifting demographics, (2) increasing popularity of the New Public Management philosophy, (3) changing perceptions of higher education from being a public to a private good, (4) significant changes in revenue streams and (5) increased pressure from state government for higher student completion rates.

Whereas enrollment growth has been taken for granted over the past decade, changes in high school completion rates and the lack of preparedness of entering cohorts challenge the validity of the enrollment and financial planning assumptions used in the past. The focus on output measures prompted by the New Public Management movement has forced administrators to think about the connection between revenues, expenditures and outcomes. In addition, the change in who pays for higher education (from government to students and their families) puts a heavier emphasis on tuition as the critical source of future revenue growth for universities. For example, as measured in constant dollars, state and local appropriations per \$1.00 in tuition declined from \$2.65 in 1991 to \$1.27 in 2006 (Wellman, 2008). New revenue streams from government contracts and grants, private giving, auxiliaries, endowment earnings, and royalties from technology licensing arrangements compel campus planners to learn how to predict these changes and understand their role in the institution's overall financial picture. Finally, while state policy-makers are increasingly using college completion rates in their funding formulae, they show little consideration for the ramp-up costs required to address changing students' needs and the demands for better quality student housing.



Martinez and Wolverton (2009) apply Michael Porter's (1980) five forces model of industry analysis to examine the changing competitive landscape as it pertains to planning for higher education. The threat of new market entrants, such as for-profit universities and two-year colleges seeking to offer new four-year degrees, can dilute the perceived value of the services offered by the traditional land-grant universities. At the same time, the growing intensity of the rivalries among traditional competitors as evidenced by new recruitment strategies and a facility "arms race" to attract new students can increase the risk of inaction with regard to the development of new academic programs and delivery channels. These considerations, as well as new threats from out-of-state online competitors, force campus planners to reexamine their assumptions regarding the nature of their competition.

Students and their parents have been empowered by government and web-based resources that offer transparency regarding the choices available, putting pressure on colleges to clarify and deliver on their value proposition. This increased bargaining power of students and competitor institutions combine to force campus planners to adopt a more sophisticated approach to setting objectives and measuring progress in order to move their organizations forward. Lastly, because the power of suppliers of labor and service providers (e.g., faculty and maintenance workers) has increased due to a lack of substitutes, there will be cost pressure on colleges as they attempt to attract and retain good talent (Martinez & Wolverton, 2009).

One limitation in the Martinez and Wolverton (2009) framework is its lack of reference to how public-private partnerships and other market-type mechanisms affect

university-supplier relationships. Another oversight is its failure to address the impact of institutionally-related foundations on the traditional power relationships between the university and alumni groups and other philanthropic entities.

Internal institutional trends also affect the planning environment. Major themes such as aging campus facilities, the demand for information resources by students and academic and administrative departments and the growing disparities in the amount and types of revenue flowing to individual academic units create difficult dilemmas for planning teams as they attempt to ration resources in an effort to address evolving vulnerabilities (Brinkman & Morgan, 2010).

#### 2.4.3 The Role of State Government in Campus Planning

State governments monitor public institutions of higher education, measuring outcomes related to retention and degrees granted. Accountability measures also are designed to help preserve public values such as the level of educational quality and equal access (Martinez & Wolverton, 2009). However, the general perception is that government involvement in higher education serves to stifle market mechanisms.

In 1950, a clear majority of U.S. states had either no formal organizational oversight over their public postsecondary education sectors or only weak voluntary associations in that role (Berdahl, 1975). Subsequently, the growing size and complexity of public higher education generated an increase in political infighting for resources and state lobbying by institutions. As a result, legislators created oversight organizations to provide expert, neutral evaluation of institutional needs (Hearn & Griswold, 1994).

Glenny and Schmidlein (1983) noted that these oversight organizations are more than simply channels of communication between institutions and politicians. They have an opportunity to exert a positive leadership role in reconciling the larger public's interests with those of the autonomous public colleges and universities. At the same time they can propel or block innovation within these institutions. Therefore, they must be viewed as potentially critical actors in any effort to improve services or reform processes in public higher education. This view fits nicely with Kingdon's (1984) theoretical conceptualization of the interplay between political and organizational forces and individual political outcomes. Kingdon notes that governance arrangements are not the ultimate determining factor in rationally organized political systems. Rather they are but one set of potentially influential forces among many.

McGuinness (1988) identified four major functions of regulatory oversight in state public higher education. They include: (1) the direct governance of public institutions (most commonly through a "board of trustees" or "board of regents"); (2) comprehensive planning; (3) academic program review and (4) resource allocation. McGuinness observed the structure of the regulatory authority gravitated toward three major categories. Twenty three states adopted a consolidated governing board structure, wherein all public universities are governed by a single board. There are also, 23 states with a state agency established as an intervening entity between the governing board of the institutions and the governor and state legislature. Four states have higher education planning agencies with limited authority.

A parallel regulatory infrastructure has developed around the state procurement process. Much of the government contracting history, at the federal and state levels, has involved finding the best combination of three factors: (1) the right contracting policies and procedures, (2) the right government-contractor relationship, and (3) the correct contract form. Nagle (1992) points to several recurring themes that attempt to address these factors from varying perspectives. First, government contracting is constantly preoccupied with the curtailment of excessive private contractor profits. The government has historically used a variety of procedures to ensure that it only pays reasonable prices including price controls, contract renegotiation techniques, the forced disclosure of a contractor's cost and pricing data and rights to audit a contractor's books. In the nation's early days through today, favoritism in awarding government contracts and conflicts of interest continue to be a fundamental concern. Historically, state agencies have shown a clear preference for a competitive bidding system in which contracts are advertised, all bidders are given a fair opportunity to compete, and with the lowest bidder receiving a fixed-price contract (Nagle, 1992).

#### 2.4.4 The Role of Institutional Foundations in the Campus Planning Process

Foundations are a critical factor in the success equation for today's public universities. However, both state and institutional planners often fail to recognize the importance of the interaction between the foundations' long-term objectives and campus initiatives. Their myopic view of the institution prevents trustees, presidents and foundation boards from making the best management decisions (Ballentine & Eckles,

2009). More often than not, state systems focus on regulatory roles with foundations rather than on cooperative efforts that would build stronger institutions through advocacy and philanthropy (Phelan, 1997).

“The primary purpose of most college and university foundations is to help raise private support for their affiliated institution or system, and hold and manage contributed assets. Many originally established to receive and steward private gifts, help segregate private and public funds, manage endowments, and facilitate financial transactions or entrepreneurial ventures that could not be undertaken effectively by state entities” (Bass, 2010, p.17).

Foundations are a critical asset for public universities for two major reasons. First, their fundraising efforts are needed to offset losses in state appropriations. Traditionally, public institution presidents and trustees have played a smaller role in fundraising than their counterparts at private institutions. About 70 percent of two-year institution boards and 90 percent of four-year and system boards of public institutions are appointed by governors or legislatures or are popularly elected (Schwartz & Akins, 2004). The political appointment process may preclude institutions from cultivating and recruiting institutional trustees with the specific experience, financial capacity, and personal and professional connections to serve as effective fundraisers.

A 1987 survey of college and university fundraising practices found that 90 percent of single campus institutions have at least one affiliated foundation involved in fundraising (Pocock, 1989). More than two-thirds of the buildings at the University of

Kansas were funded or furnished by its foundation, which also allocated \$587 million in support of students, faculty programs, research and capital projects over the past five years (Bass, 2010)

A second reason why foundations are important is that their boards are often better equipped to maintain the long-term planning perspective essential to endowment management and to building fundraising capacity. Institutional governing boards must focus on annual budget cycles and are subject to pressure from internal and external stakeholders (Bass, 2010).

Recently, however, foundations have come under public scrutiny and the extension of state freedom of information laws may threaten their independence and impede their fundraising capabilities. Roha (2000) suggests that foundations have an obligation to safeguard the privacy of donor records and “trade secrets” concerning donor prospects, business decisions, development strategies and investment strategies. He feels that the extension of state freedom-of-information laws to foundations would compromise the privacy of foundation records, practices and strategies. In addition, it would undermine their capacity to effectively raise and manage private resources, and impose upon them undue compliance burdens (Roha, 2000).

Because of their specialization in matters of fiduciary accountability, institutional foundations have increasingly become involved in being the private partner in student housing PPPs and campus projects in general. A major advantage of having foundations involved in real estate matters is that they are able to secure financial resources for real estate projects more quickly than university administrators or trustees. This dexterity

results from not having to submit to varying levels of state approvals, since they are private organizations. One example of note is the University System of Georgia Foundation. The University System of Georgia Foundation, Inc. formed the USG Real Estate Foundation, LLC in 2008 for the purpose of constructing and renting the projects to institutions within the University System of Georgia on real estate owned by its Board of Regents. This is, perhaps, one of the premier examples of a system-wide public-private partnership. To date, fifteen projects on thirteen campuses totaling \$317 million have been financed through the USG Real Estate Foundation (University System of Georgia, 2012). The USG Foundation provides professional, financial and administrative services to the Office of the Chancellor, the Board of Regents, the USG system office and institutions as an advocate of the University System as a whole.

Another example of a foundation's activities in student housing involves the San Diego State University (SDSU) Foundation's development of the Piedra del Sol apartment complex. The complex was built as part of the SDSU Foundation Redevelopment Plan to help meet the university's need for student housing. The apartments were financed by the SDSU's Foundation and the 200+ beds were included as part of SDSU's housing stock. The Dormitory Revenue Fund (DRF), the traditional source for financing for California State University schools, was not involved in this project. By not using the DRF, the Foundation was able to acquire a new site while keeping the debt off of its balance sheet, which otherwise might have rendered the project unfeasible. In early 1999, a management contract was signed between the SDSU Foundation and the university, which allowed the Housing and Residential Life Office

(HRLO) to operate and manage the apartments. HRLO received a percentage of the rental revenue similar to the compensation a property manager would receive. HRLO provided residential life staff and programming (Turner, Kaplan, & Thompson, 1999). These results correspond to the findings in the case analysis presented in Chapter Five of the University of South Carolina Upstate which used a foundation to complete its PPP project.

#### 2.4.5 The Characteristics of the Student Housing Plan

As detailed by Abramson (2005),

“The need for more and better facilities, the cost to students, and budget cuts that affect maintenance and operations are considered the three major issues facing chief housing officers through the next five years” (p.1).

The demand for new residence hall facilities stems from several factors. First is the fact that current housing stock, typically constructed in the 1950’s and 1960’s and dominated by the dormitory-style buildings (barracks-style with “gang” bathrooms in the hallways), no longer meets students’ and parents’ expectations. “...student’s priorities are amenities, privacy and single units – having a ‘hotel’ experience rather than a ‘college’ experience” (Moore, 2012, p. 11). Secondly, creating new student housing stock is a major strategic move in the transformation of many commuter schools to a residential campus.

Many schools recognize that the complexity of coordinating multiple objectives requires a comprehensive housing strategy that is shaped by the college’s mission



statement to provide guidance on specific institutional objectives (Marsters & Bliss, 2007). One of the many benefits of a comprehensive student housing plan is in its ability to provide a shared vision of housing expectations for residents, administration, prospective recruits, consultants and the donor community. The model process for completing a housing plan includes the following:

1. Assembling an in-house planning team;
2. Consideration of the impact of the college's goals on the proposed housing strategy;
3. Identification of the types of housing desired by the college with estimates of space required;
4. Evaluation of the resources available for implementing the desired housing assets; and
5. Developing a multi-year, comprehensive housing strategy (Marsters & Bliss, 2007).

A comprehensive housing strategy is shaped by the college's mission statement because it provides guidance on specific institutional goals (e.g., to evolve from a commuter school to a residential campus, to have a more balanced gender mix, to improve student retention, etc.). A housing plan should also address policies not included in the mission statement as well as guidelines from a strategic plan. Examples of such policies include the use of thematic housing (e.g., language or honors programs) and potential for alternative revenue sources (e.g., executive education seminars). Finally, the plan should ensure that new housing initiatives (1) build on the strengths of the existing

inventory, (2) include an assignment strategy mindful of student preferences, (3) include adequate support space, and (4) take into account financial, personnel and physical resources to build and renovate as appropriate.

Rutgers, the State University of New Jersey, provides an example of how and why a student housing plan is developed. In 2005, the school's new president proposed his vision of a single college of arts and sciences with unified admissions, academic standards and an integrated student life program. Prior to this, the university had four individual colleges (Rutgers, Livingston, Douglass and Cook) with different residential campuses. The president wanted a strategic plan for the university that would achieve a positive, standardized on-campus living experience for all students.

The plan consisted of a projection of future demand for the on-campus housing system and the off-campus market's ability to absorb it. It included a comprehensive housing financial model and identified potential project implementation strategies, including new construction ideas for several sites as well as renovations to existing residence halls. The planning team reconciled the administration's goals with the priorities of the student population to ultimately deliver a comprehensive, financially feasible housing master plan (Rutgers, 2012).

The challenge for those responsible for the development and implementation of a student housing plan is to coordinate its administration with other planning activities on a campus (e.g., financial, strategic, general facilities, foundation, state, etc.). Brinkman and Morgan (2010) suggest that the viability and success of a planning organization relies heavily on its location in the university organization. They found that operating a

planning function from the president's or provost's office enhances access to a greater variety of data and to people who understand the data and forces the integration of planning and budgeting organizationally (Brinkman & Morgan, 2010).

## 2.5 Project Performance in a Construction Science Context

The construction science literature was valuable in explaining the relationship between construction delivery methods and project performance (e.g., construction completion time, cost and quality). All of the developers involved in PPP arrangements who were interviewed for this study used the Design-Build (DB) construction delivery method. Therefore, it is important to consider whether or not a Design-Build contract contributes to the ability of a PPP to achieve a shorter project completion time when compared to alternative construction delivery methods.

Design-Bid-Build (DBB) is the preferred construction delivery method of most government agencies. DBB is a two contract phase arrangement, whereby the procuring agency contracts with design/engineering team to provide drawings from which the project is then bid resulting in a construction contract awarded to the lowest qualified bidder. A major reason for this preference is that it provides an element of competition that makes the procurement process politically defensible should something go wrong. In a traditional DBB contract the architect is responsible to the owner to review the work of the builder to ensure that the deliverables meet specifications and codes. At the same time, the general contractor who has experience working with many designers can pick up design flaws which might be overlooked when the general contractor also is

responsible for the project's design (as would be the case under a Design-Build arrangement).

Under a Design-Build arrangement, there is only one contract written between the procuring agency and the general contractor/developer for the complete design and construction of the project. Recent literature provides evidence that DB projects are superior in performance in almost every measure to Design-Bid-Build projects (Hale, Pramen, Shrestha, Gibson, & Migliaccio, 2009). The findings from their analysis of 77 projects involving the construction of military barracks over the period from 1995 through 2004 indicated that the mean DB project duration is less than half of the mean Design-Bid-Build duration (667 days versus 1398 days). Project duration was calculated as the difference between the date of the first contract action and the project completion. In addition, while statistical significance was not found, the data also seemed to indicate that Design-Build projects may be less expensive to build than the traditional contract method of Design-Bid-Build (Hale et al., 2009). The present research is similar in its approach, but defines project duration (Project Completion Time) as the number of days between the date of project approval and the day on which the certificate of occupancy is signed.

The Design-Build team is responsible for taking a concept developed by the owner, completing the detailed design, and then, pending the owner's approval, proceeding with construction. The main advantages to using a DB contract are that the construction and design teams are motivated to work together to develop a design with constructability in mind. Thereby it is possible for the teams to creatively find ways to

reduce construction costs without reducing project functionality. Also, DB has positive schedule implications as certain early-stage construction activities can occur concurrently with the design process. The owner can expect a reduced price because of the increased constructability of the design and reduced schedule. A possible problem with DB contracts is that there is an inherent conflict of interest. There is risk that a building could be over-designed in order to increase costs, or the project could be built with inferior products to maximize profits for the builder-designer (Hale et al., 2009).

In a national survey of managers of Design-Build projects sponsored by the U.S. Department of Transportation (SAIC<sup>13</sup>, University of Colorado & AECOM<sup>14</sup>, 2006), consultants found that, on average, the Design-Build project delivery method reduced the overall duration of transportation construction projects by 14 percent, reduced the total cost of the projects by three percent, and maintained the same level of quality as compared to projects that used a Design-Bid-Build project delivery method. Similarly, a comparison between DB projects and similar DBB projects showed a nine percent difference in total project duration and a 13-percent difference in construction phase duration (SAIC et al., 2006).

The SAIC et al. (2006) study was the first comprehensive analysis of the use of Design-Build construction delivery methods to involve both program and project

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<sup>13</sup> SAIC, Inc. (formerly Science Applications International Corporation) is an American defense company headquartered in McLean, Virginia. The company provides scientific, engineering, systems integration, and technical services and solutions to a variety of U.S. federal agencies including the Departments of Transportation, Defense and Homeland Security, as well as other government agencies and selected commercial markets.

<sup>14</sup> AECOM Technology Corporation is a global provider of professional, technical and management support services to a broad range of markets, including transportation, facilities, environmental, energy, water and government. It is headquartered in Los Angeles, California.

managers of transportation agencies who are directly responsible for Federal-aid highway projects delivered under this approach. The study compared actual results in terms of schedule and budget from similar pairs of completed projects, one using a DB delivery method and the other using a DBB project delivery method. A sample of 86 projects completed by the end of 2002 was selected for the survey, representing 22 states and a broad cross-section of completed projects by type and size. The study compared the mean, median and standard deviation of performance measures such as cost growth, delivery speed, schedule growth, and quality. In addition, a multivariate analysis based on a least squares regression model was used. Finally, a statistical analysis of performance comparisons was used to determine the relative significance of the results and level of confidence regarding their interpretation.

The results of the Department of Transportation study point to the possibility that the construction delivery method could be an important driver of project performance in regard to construction in the present model. As in the study by Hale et al. (2009), project duration is defined as the elapsed time between construction start and finish. However, because Design-Build is available as a construction delivery alternative for most state government contracts (including student housing) it is important to determine if there are other, non-project related variables that influence the time required to complete an on-campus student housing project. This is the reason why the dependent variable, Project Completion Time, has been introduced in this research. This variable introduces both institutional and state-level variables that also might influence project performance in the short and long run.

There are several features of the Design-Build process that drive the observed reduction in project duration. For example, Design-Build eliminates the need for a second procurement cycle by combining the contracting for both design and construction contracts. This process also integrates these functions during the project development lifecycle, while Design-Bid-Build keeps the stages contractually separate. Moreover, Design-Build allows for the development of designs that are more constructible and require fewer design “fixes” through change and extra work orders. Finally, DB offers the developer the ability to parallel process activities occurring on different portions of a project allowing for more potential time and cost savings, while Design-Bid-Build keeps these processes sequential (SAIC et al., 2006).

Construction Manager at Risk (CMR) is a delivery method which entails the construction manager (CM) to act as a consultant to the owner in the pre-development and design phases of a project. Subsequently, the CM makes a commitment to deliver the project within a guaranteed maximum price (GMP) range and serves as the equivalent of a general contractor during the construction phase. A key advantage of this arrangement is supposed to be the budget control feature. However, the literature is mixed regarding the actual benefits that can be achieved under this construction delivery method (Rojas & Kell, 2008). The primary intent of the Rojas and Kell (2008) study was to determine whether the CMR method met cost performance expectations for Pacific Northwest public schools when compared to DBB contracts. Data on 273 DBB and 24 CMR projects were analyzed. Surprisingly, the research found that the mean construction cost

growth<sup>15</sup> was higher for CMR than DBB. As a result, the research concluded that the GMP is not necessarily an effective guarantee of maximum construction cost (Rojas & Kell, 2008). While it is not the primary focus of this research, the present study will test the hypothesis that construction delivery method impacts project completion time.

In the field of construction science, there is a body of literature focused on construction project evaluation that applies to PPPs. This is relevant because this research will be testing the effectiveness of PPPs against criteria derived from these construction project evaluation methods. One such set of criteria to be considered involves the contribution PPPs make to project success. The criteria of project success can be defined as the set of principles or standards by which favorable outcomes can be completed within a set specification. (Chan & Chan, 2004, p. 204).

Historically, the primary criteria used to determine construction project success are time, cost and quality. Atkinson (1999) called these three criteria the “iron triangle” and they are identified and discussed in numerous articles on project success (Belassi & Tukel, 1996; Hatush & Skitmore, 1997; and Walker, 1995, 1996). Pocock, Hyun, Liu, and Kim (1996) further suggested that the absence of legal claims against the developer or sponsor might also be used as an indicator of project success.

Some researchers added the dimension of customer satisfaction to the aforementioned success criteria and attempted to define quality in more detail. Songer and Molenaar (1997) considered a project as successful if it is completed on budget and on schedule, conforms to user’s expectations, meets specifications, attains quality

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<sup>15</sup> The authors define project cost growth as the difference between the final construction contract cost and the pre-bid owner’s estimate (Rojas & Kell, 2008).



workmanship and minimizes discord during the construction process. Kumaraswamy and Thorpe (1996) included a variety of additional criteria in their study of project evaluation. These include the ability to meet budget, schedule, and quality targets, satisfy client and project manager's expectations, transfer the appropriate levels of technology to the client, and maintain a friendly, health and safe environment.

Atkinson (1999) similarly divided project success into three stages involving the process, the system and the benefits. The process stage considers cost, time, quality and efficiency measures. The system stage considers how stakeholders will benefit. The benefits stage considers the project's impact on the customer and its success from a business standpoint. Figure 2.5 below shows Atkinson's model of measuring project success.

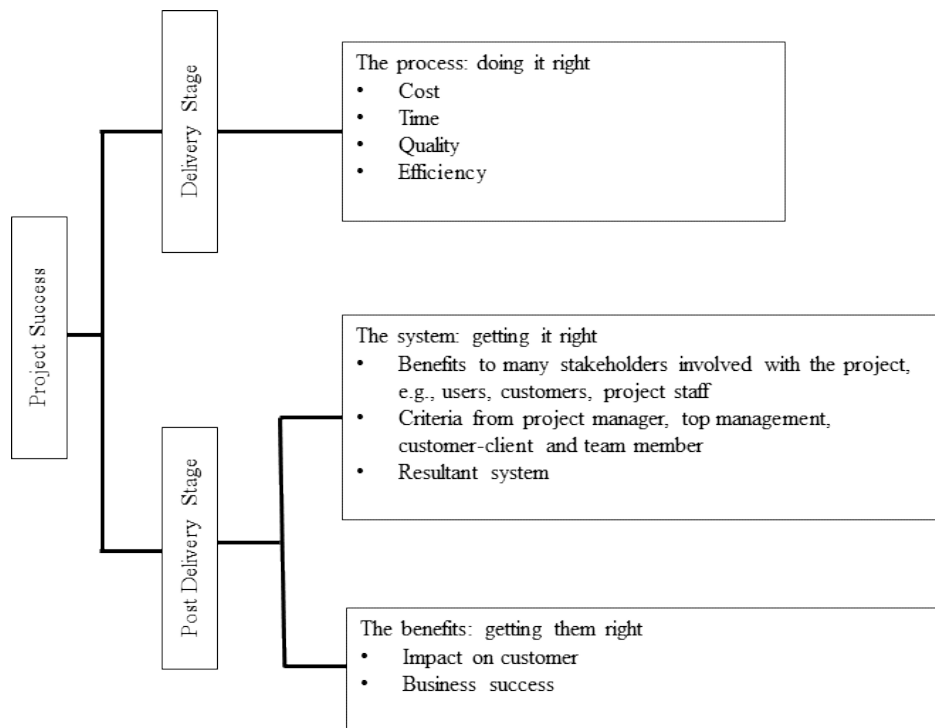


Figure 2.5: Atkinson's Model of Measuring Project Success (as adapted from Atkinson, 1999, pp. 339-340)

Sadeh, Dvir, and Shenhar (2000) divided project success into four dimensions. The first dimension is meeting design goals, which applies to the contract that is signed by the project sponsor. The second dimension is the benefit to the end user, which refers to the benefit to the customers derived from using the end products. The third dimension is benefit to the developing organization, which refers to the benefit gained by the developing organization as a result of executing the project. The last dimension is the benefit to the technological infrastructure of the country and of firms involved in the development process. Table 2.4, developed by Sadeh et al. (2000), presents project success from a broader, stakeholder-based perspective.

<b>Success Criteria</b>	<b>Success Measures</b>
Meeting design goals	<ul style="list-style-type: none"> <li>• Functional specifications</li> <li>• Technical specifications</li> <li>• Schedule goals</li> <li>• Budget goals</li> </ul>
Benefit to the end user	<ul style="list-style-type: none"> <li>• Meeting acquisition goals</li> <li>• Answering the operational need</li> <li>• Product entered service</li> <li>• Reached the end user on time</li> <li>• Product has a substantial time for use</li> <li>• Meaningful improvement of user operational level</li> <li>• User satisfied with product</li> </ul>
Benefit to the developing organization	<ul style="list-style-type: none"> <li>• Had relatively high profit</li> <li>• Opened a new market</li> <li>• Created a new product line</li> <li>• Developed a new technological capability</li> <li>• Increased positive reputation</li> </ul>
Benefit to defense and national infrastructure	<ul style="list-style-type: none"> <li>• Contributed to critical subjects</li> <li>• Maintained a flow of updated generations</li> <li>• Decreased dependence on outside sources</li> <li>• Contributed to other projects</li> </ul>
Overall success	<ul style="list-style-type: none"> <li>• A combined measure of project success</li> </ul>

Table 2.4: Project Success Criteria and Measures (as adapted Sadeh et al., 2000, p. 17)

Most of the major recent research on construction performance criteria lists the time factor (or schedule-related goals) as a key measure of a project’s success. While there are other important performance measures that influence a public institution’s ability to achieve its policy objectives, this research will focus on determining how PPPs affect the “time” leg of the “iron triangle.”

Naoum (1994) identified three formulae that are useful to calculate “time”, namely construction time, speed of construction and time variation. Construction time is the absolute time between project commencement and completion. It is calculated as the number of days/weeks from project start to its practical completion. See Equation (1) below.

$$CT = PCD - PSD \quad (1)$$

Where,

CT = Construction Time is the number of days to complete a construction project.

PCD<sup>16</sup> = Practical Completion Date is the date on which the project receives its certificate of occupancy.

PSD = Project Start Date is the date on which work is first done on the project.

Construction Speed is the relative time it takes to complete a project, which is defined by gross floor area divided by the construction time. Construction speed is measured in square feet completed per day as detailed in equation (2) below.

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<sup>16</sup> The practical completion date is the day on which a building is deemed completed as documented by the date that is either on the certificate of occupancy or the date the certificate of practical completion is signed. Practical completion is the documented verification that all mechanical systems are functioning as designed and tasks included in a construction contract have been satisfactorily completed to the standards defined in a specification document. A certificate of practical completion is usually prepared by the contract superintendent (as opposed to an impartial local government official who signs the certificate of occupancy) who represents a client’s interests in ensuring work performed has been carried out as described in the contract. The signing of either certificate triggers payment of the balance of the contract value to the contractor.

$$CS = \frac{GFA}{CT} \quad (2)$$

Where,

CS = Construction Speed is the number of square feet completed per day.

GFA = Gross Floor Area is the total number of square feet in the building.

CT = Construction Time is the number of days to complete a project.

Time variation from original contract is measured by the percentage of increase or decrease in the estimated time to complete a project, as measured in days, discounting the effect of any extension of time that may have been granted by the client. See equation (3) below.

$$TV = \frac{CT - RCP}{RCP} \times 100\% \quad (3)$$

Where,

TV = Time Variation is the percent difference in actual construction time from the contracted construction time.

CT = Construction Time is the actual number of days required to complete a project.

RCP = Revised Contract Period is the number of days scheduled and mutually agreed to for contract completion.

Examinations of project cost savings resulting from PPP arrangements appear frequently in the literature with mixed findings (Hodge & Greve, 2009). Project cost was not considered to be an important variable in this study for several reasons. The cost of new student housing is the result of a combination of factors including decisions by different stakeholder groups related to project-specific attributes, institutional requirements and project management choices (Ryan, 2003). These include requirements in the program statement, site constraints, the choice to Design-Build or Design-Bid-Build, selection of an architect, university construction standards, whether or not ancillary project components such as new parking spaces or campus green space are subsidized by the auxiliary department and change orders (changes to the construction plans), among others.

In addition, interviews with construction science faculty at Clemson (D. Bausman, interview granted on January 15, 2012) indicated that it would be difficult to obtain the “true” project cost from developers. Under a typical PPP arrangement, private developers are compelled by contract to deliver the project on time and on budget. Developers are under no obligation to reveal their true costs. Costs also vary widely by the competitiveness of a bid, by the period in the business cycle in which the contract was bid, by level of unionization in the state or at a specific institution and regional

differences, among other things. As a result, it was determined that any attempt to compare project cost would not be meaningful at this time. However, Appendix E contains data on the range of costs for varying sizes of US college residence halls.

## 2.6 PPP Performance in a Public Value Context

Any set of performance evaluation criteria for infrastructure projects should include some measure of public value creation. Over the past decade there have been several attempts to define and measure public value in the public sector. The concept of value-for-money (VfM) has been examined by numerous British scholars in the past decade with respect to public capital projects (Burger & Hawkesworth, 2011; Coulson, 2008; Grimsey, & Lewis, 2005; Hellowell & Pollock, 2010). This is largely in response to VfM being used in the United Kingdom as a benchmarking process to support its Private Financing Initiative. In this initiative, thousands of national and local infrastructure projects were financed under public-private partnership arrangements between 2000 and 2010. The value-for-money concept attempts to address the interests of the taxpayers as well as the recipients of the targeted public services.

Theoretically, any infrastructure project, whether a PPP or one procured through a traditional government process, should be undertaken only if it creates public value for the money invested. Consequently, if the evaluation of a PPP project produces a larger Net Present Value (NPV) than one procured through the government-only alternative, that option should be selected. The calculation of value-for-money is a modification of the NPV analysis often used in capital budgeting decisions.

VfM is one of the leading management tools available for public agencies looking to assess the value of pursuing a project through a PPP versus the traditional procurement process (Morallos & Amekudzi, 2008). The major component of a VfM analysis is the public sector comparator (PSC). The PSC is a hypothetical scenario that estimates the net present value (NPV) of the expected life cycle costs to the public agency if it were to pursue the project in question through a traditional procurement process. The PSC typically consists of four components: (1) the raw PSC, (2) a comparison under competitively neutral conditions, (3) a valuation of transferable risks and (4) a valuation of retained risks.

The raw PSC value accounts for the capital and operating costs of producing the project in question. The competitively neutral comparison removes the inherent advantages or disadvantages available to a government agency (e.g., lower financing costs available to the sponsoring agency) PSC and the PPP to be compared at an equal level. The valuation of transferable risks assesses the dollar value of the risks that would be transferred from the public agency to the private sector partner. Such risks include delivery risk (e.g., the risk that a project might not be delivered on time), financing risk (e.g., the amount of money that the contractor might have at risk for the project) and market risk (e.g., the amount the contractor would lose should the residence hall not achieve full occupancy). The analyst would then quantify the value of those risks that would be retained and presumably be better managed by the procuring authority.

Criticisms of the VfM methodology are that inappropriate discount rates are used, that project and financial risk are not allocated appropriately, and that there is an inherent



bias<sup>17</sup> in the way the comparison between the public sector comparators and the PPP models is completed. In addition, Morillos and Amekudzi (2008) recommend that VfM assessments incorporate a quantification of the value associated with social costs and benefits under either procurement option that is used.

From an institutional perspective, research from Buger and Hawkesworth (2011) identified additional challenges to using VfM to analyze projects. Their research revealed that, in numerous cases, accounting standards, political preferences against PPPs, and the strength of public sector unions skewed incentives in favor of the traditional capital procurement method over PPPs in OECD countries. They found these incentives created a bias against PPPs in a number VfM calculations reviewed.

VfM tries to quantify the benefits to the taxpayer of having a private sector partner build a project that was formerly done by a government agency. While the gesture is a noble one, it is flawed as it leaves too much room for subjective interpretation and abuse. The objective of this type of analysis is to determine when it makes sense to use a PPP and when it does not. The new variable developed as a performance measure in this dissertation, Project Completion Time, provides an alternative that is an unbiased predictor of public value measured as project-days saved when using a PPP which should translate to cost savings as well as a new concept, time value of service. That is, measuring the advantage that PPPs might provide of reducing the duration of the project and being able to deliver the service more quickly.

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<sup>17</sup> Some critics speculate that it was always the intention of government agency analysts to prove that the PPP option was more cost effective than the public sector option in order to circumvent the capital budget constraints.

Much of the New Public Management literature focuses on improvements in the identification and control of government agency outputs. Cole and Parston (2006) suggest that public managers who can articulate the intended outcomes of their organizations and programs and then measure their progress in achieving those outcomes, make their organizations accountable in the public's eyes and improve their performance over time. They developed a Public Service Value Methodology (PSVM) as a way to evaluate an organization's ability to achieve key social outcomes cost-effectively. Results are aggregated to provide a measure of relative public value creation over time. However, the PSVM has limited application to public activities whose outputs lack a quantifiable value on their own accord, but serve as inputs to other operational objectives (e.g., departmental information technology services). This is one reason why variables related to student learning outcomes were not included in the present research.

This research introduces the concept of Time Value of Service to integrate the "time" component of the "iron triangle" in construction projects with the Time Value of Money, a central concept in finance theory and Public Value Theory. The basic premise of Time Value of Money is that time impacts the value of a dollar. In other words, a dollar received today is worth more than one received at some future point. The concept implies that the sooner the firm receives contracted funds, the more quickly it can put those funds to work to earn more money. The source of such funds can be rental income, interest on investments, or any number of cash-generating arrangements. Conversely, the longer it takes to receive cash inflows, the less a future dollar is worth today. This is the result of investment and/or consumption opportunities lost. Applications of the principles

of Time Value of Money are found in decisions involving capital budgeting, capital structure, cost of capital, and working capital management (Titman, Keown & Martin, 2011).

Similarly, from the point of view of the consumer of public services, time impacts the value of a public service rendered. The basic premise of time value of service is that services received today are worth more to the consumer than services received at a future date, assuming other factors are held constant (e.g., cost, quality, legality, etc.). In an extreme example, if your local fire department arrived at your house an hour after you had reported a fire, the department's services would have been less valuable to you than if they had been rendered within minutes after the fire had started.

One of the advantages of using PPPs as a project delivery method cited by Hodge and Greve (2010) is that these arrangements offer better "on-time and on-budget" performance than traditional government procurement processes. Because of contractual incentives and penalties, the private partner is financially motivated to deliver the project when scheduled and at the agreed-upon cost. In addition, according to numerous interviews and email correspondence that served as a basis for this research, there is a perception among a broad range of U.S. public college and university real estate administrators that PPPs are able to deliver student housing projects faster than the traditional state capital procurement process.

## 2.7 Student Housing at Public Universities

Since the subject of this dissertation involves residence halls at public universities, it is important to have a basic understanding of today's student housing strategies in the context of the historical and the modern university campus.

State colleges and universities in the United States serve a complex mix of stakeholders. In their non-profit function, their objective is to educate students and disseminate knowledge from research in the most cost-effective way. In their administrative role, they seek to preserve public assets for posterity, to be enjoyed by citizens of the state as well as visitors. Finally, as a public enterprise, they seek the holy grail of self-sufficiency by generating positive cash flow in their operations. As a result, these schools must adopt an evolved system of accountability that supports a continuous improvement process which will allow them to be more responsive to multiple constituencies, while at the same time, be more competitive.

In his seminal book on university architecture, Edwards (2000) observed that the dominant theme in the evolution of the modern campus is the tension between the historical origins of the institution as a place for enrichment beyond the formal, classroom-based experience, and the increased pressure to rationalize service provision and space allocation. He saw it as “a battle between picturesque place making and the provision of rationally designed buildings” (p.34).

Traditional college campus buildings are designed to evoke an emotional response from their users. On the well-designed campus, collectively, campus buildings should produce a memorable experience that will compel recurrent classes of alumni to return

and/or financially support the well-being of the institution. Historically, while cost and functionality have been important considerations, visual impact of the campus, as a reflection of the institution's values and image, has been one of the dominant objectives of most universities (Gaines, 1991).

Unlike their commercial counterparts, college campus structures serve a "public purpose." As such, they have historically been designed with future generations of users in mind. For this reason, the design and construction of these buildings requires a particular sensitivity to their iconic nature and the fact that they are to last forever, such as any great monument to the aspirations of mankind (Gaines, 1991).

The American campus possesses qualities and functions different from those of any other type of architecture (Turner, 1990). One of the most important qualities is the equilibrium between change and continuity. As a community, the campus is complex and subject to growth and change. It cannot be viewed as a static architectural monument. Unlike a city, a campus requires a special kind of physical coherence and continuity. As institutions, college campuses have purposes and ideals. The campus serves the institution not only by satisfying physical needs, but by expressing and reinforcing their ideals or goals.

"The campus reveals the power that a physical environment can possess as the embodiment of an institution's character" (Turner, 1990, p. 305). Despite the fact that institutions grow and change in numerous ways, most college campuses have a special individual character, embodied in its buildings, landscape and natural settings, that

endures over time. The campus is an expression the school's educational ideals which are meant to endure for successive generations of students and faculty.

Research into teaching and learning in higher education has slowly influenced both campus design and formal educational program structures. The shift towards a "student centered pedagogy" recognizes that knowledge is not "delivered to", but rather "constructed by" the student, and that learning is a social process requiring active engagement with others in meaningful experiences (Biggs, 1991).

In Edwards's (2000) view, a "sense of place" is the essence of a university. Jamieson (2009) feels that in order to nourish learning in its fullest sense, the development of the modern campus should be "informed by a sophisticated understanding of place and its significance for individuals and how they live their lives" (p.24). According to Jamieson, this approach will enable the university to transcend its current status as a collection of institutional facilities.

In today's complex economy, concept of place is a major component of establishing a "brand identity" for the university. The modern university competes in a quasi-market environment. Both public and private institutions of higher education are subject to some level of government oversight (e.g., accreditation, audits of research funding, etc.). At the same time, they must compete nationally (and internationally) with other schools for top students and donor contributions. To attract qualified, motivated students, they are similar to corporations that seek to attract loyal customers. A positive image (or brand) translates into enrollment for higher education institutions just as an image generates sales for private corporations (Flynn & Vredevoogd, 2009).

A university's brand image reflects many institutional dynamics. However, to be an effective marketing tool, the institution must understand what appeals most to the students they seek to recruit. Today, the "field of dreams"<sup>18</sup> approach is an ineffective strategy for all but the most elite schools.

Just as business leaders have increasingly focused on branding as the marketing means to shape identity and appeal for their product, colleges and universities need to understand the needs, expectations, and perceptions of their stakeholders and constituents and align their brands accordingly (Flynn & Vredevoogd, 2009, p.8).

The group character of students entering college today is shaping the design of higher education space. Millennials, the generation of students born between 1982 and 2002, have already begun to influence space planning, design, and construction in higher education and will continue to transform the academic environment as they return to campus as faculty and staff (Rickes, 2009). The quality and quantity of campus facilities play a clear role in a student's decision to attend a particular university. In a comprehensive study by Cain and Reynolds (2006) of the physical factors related to a college campus that influence a student's choice of institution, 73 percent mentioned facilities related to the student's academic major, 53 percent the library, 51 percent the academic technology, 50 percent the classroom buildings and 42 percent the residence halls.

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<sup>18</sup> In the 1989 film, *Field of Dreams*, the statement by one of the main characters, "if you build it, they will come," has become a part of the American vernacular.

Today's students expect their residence halls to have all the comforts of home and more. For example, private bathrooms are not only preferred, but expected. These students tend to be more "electronically engaged" than previous generations, which puts a strain on residence hall electrical systems. In addition, the median square footage per bed continues to increase, currently exceeding 350 gross square feet (Abramson, 2010). In addition, almost one-third of recently completed residence halls include classrooms to support a living-learning environment. New residence halls also typically include study rooms, kitchens, television rooms and a laundry.

One issue looms large as a challenge to the "arms race" strategy currently pursued by college administrators to attract and retain students. This is the concern that rapidly escalating costs incurred to build and support new student housing facilities will exacerbate the already high price (real and/or perceived) of a college education. The cost of housing and auxiliary services alone at state research universities are increasing at a rate of two percent per year. This increases the risk that many students will choose to live off campus. Such a trend would defeat one of the key objectives of single campus institutions today, which is to create living-learning communities among their students. The research indicates that the cost savings that may be garnered from using PPPs (as suggested in the findings of this study) will not likely translate into lower pricing to students, as administrators at public institutions are likely to use any additional cash flow to replace declining state revenues (Wellman et al., 2009).



## 2.8 Management of Student Housing as Social Infrastructure and Corporate Assets

As a result of its need to address multiple strategic objectives, student housing at public universities represents a hybrid form of real estate. It has attributes of both corporate real estate and social infrastructure. As with corporate real estate, the impact of student housing on organizational productivity and institutional mission is of equal, if not greater importance than the cost or value of the real estate asset itself (Veale, 1989).

Unlike investments in individual real estate projects and dedicated real estate portfolios, which lend themselves to quantitative output measures (e.g., internal rate of return, return on equity and return on assets), corporate real estate outputs are usually the internal inputs to other mission-driven processes. As such they may be more closely tied to the nature of the organization and lack a market in which pricing or performance comparisons can be made (McDonagh, 2002). As a result previous performance research has focused on inputs to, and the process of, corporate real estate decision-making (Gibson, 2006).

Veale (1989), Toeh (1992), Gibson (2006) and others found that communications and effective working relationships with the leadership team, and the finance and operating divisions, are of utmost importance to the achievement of high corporate real estate performance from an asset management perspective. According to Gibson (2006), the five essential skills in effectively managing corporate real estate include : (1) strategic planning; (2) real estate portfolio management (understanding how to leverage opportunities within the portfolio); (3) negotiating and deal making within the politics of the organization; (4) understanding the organization's core business activities; and (5)

customer relationship management (being clear on how internal customers are defined and where the power base lies within an organization).

Social infrastructure, and student housing in particular, has characteristics similar to corporate real estate. However, by the nature of its complexity, and the multiplicity of its stakeholders, the management of student housing facilities requires a higher level of strategic skills. Historically, student housing, as well as other state university assets, has been managed like other types of public infrastructure. However, for reasons noted below, this mindset is changing.

In general, federal, state and local government agencies produce public infrastructure to support economic activity (economic infrastructure) and social welfare goals (social infrastructure). They do this with assets such as roadways, water supplies, wastewater systems, power supplies, hospitals, school buildings and other assets. These assets are typically owned and managed by local government agencies or public enterprises. They are stationary systems created as integral parts of a network of assets that serve the whole community. Public infrastructure systems are intended to be maintained indefinitely at a particular level of service by the continuing replacement and refurbishment of its components (NAMS, 2006). Investment in these assets is made with the intention that dividends will accrue to the economy through increased productivity, improved living conditions and greater prosperity (Association of Local Government Engineers of New Zealand [ALGENZ], 1998).

Student housing at public universities exhibits all of the attributes of social infrastructure. However, as typical of social infrastructure in general, the social and

financial objectives of college housing are interdependent. On the one hand, a key focus of student housing is on learning outcomes. As Riker and DeCoster (2008) noted, the role student housing plays in education is founded on two basic and important assumptions. Within the residential campus community students experience both a physical and an interpersonal environment. Each communicates something to them on a daily basis. Thereby, adequate physical facilities that support the educational process contribute in important ways to student learning. Riker and DeCoster (2008) note that “The interpersonal environment can, likewise, either facilitate learning or, if impoverished, inhibit the educational process” (Riker & DeCoster, 2008, p. 81).

On the other hand, momentum in the New Public Management movement in the 1990s and a growing emphasis on quality and the achievement of a “return on investment” for public dollars invested in public goods has led to the rise of performance accountability systems in U.S. higher education. The idea was that using business-type accountability measures would drive change in institutional behaviors that would lead to gains in student learning, higher graduation rates and higher rates of graduate placement in good jobs (Dougherty & Hong, 2005).

In their study of two-year colleges, Dougherty and Hong (2005) found that while performance accountability systems may be effective in changing the behavior of institutions, it is uncertain whether the resulting changes are all good and whether the incentives may at times lead to undesirable outcomes. For example, one unintended consequence noted is the weakening of academic standards in order to boost graduation and completion rates. Equally disturbing was the fact that schools might be incited to

keep retention and graduation rates up by limiting the enrollment of less-prepared students, thus undercutting the community colleges' commitment to open-door admissions. In addition, performance accountability often imposes considerable compliance costs on community colleges for which they are not fully reimbursed. Compliance with data-reporting requirements can require large outlays of money and time.

Performance based funding (PBF) or Accountability Based Funding, is a trend that dates back 15 years in the United States. South Carolina started such a program for public universities in 1996. The system relied on nine critical success factors supported by approximately 70 indicators. Administered by the SC Commission on Higher Education, the program ultimately failed because it was found to be too cumbersome. The additional manpower needed by the Commission to administer the program was not funded by the state legislature. Moreover, the performance system lost credibility when the legislature decided not to appropriate sufficient funds to reward high achievers under the program due to budget constraints (G. Glen, Finance Director, South Carolina Commission on Higher Education. Interview granted on July 29, 2011).

## 2.9 Conclusion

There is a major public policy problem emerging involving the provision of student housing facilities (and other capital assets) at public universities. The question of growing importance is: How will public institutions of higher education provide good

quality buildings to meet the student demand and serve the state's labor-readiness agenda, in an environment of dwindling financial resources?

On a national level, Dogherty and Hong (2005) note that the core policy issues faced by U.S. institutions of higher education boil down to:

- (1) The institutional business model. The institution's business model may be inappropriate. The high and increasing cost of producing a degreed student may be unsustainable without increasing state subsidies. If an increase in state subsidies is politically not feasible, alternative models must be considered;
- (2) The ability of institutions to control costs. It is mandatory that those working in academia shift their mindset from growth strategies based on just higher revenues (e.g., higher tuition, more students, more research) to include cost control (e.g., online course delivery, cloud computing, etc.). In an increasingly competitive market place, it is not realistic to assume that customers will continue to support high fee structures based on antiquated cost assumptions when more affordable solutions are available to them;
- (3) Institutional outcomes. Internal systems must be in place to ensure that institutional outcomes are meeting mission objectives. At the end of the day, the public universities must be able to produce a sufficient supply of skilled workers for the state to remain economically competitive; and
- (4) Institutional credibility. The relationship between public universities and their state politicians and regulators must evolve to allow them the flexibility to make

more decisions more quickly. At the same time, the institutions must demonstrate, through tangible results, that the independence they seek is warranted.

Decisions to replace and develop new buildings on state university campuses are increasingly evaluated in the context of these four considerations.

However, the general public and their elective representatives lack a concrete set of criteria for determining whether they are receiving “value-for-money” invested by taxpayers in these institutions. Cost has not been an effective performance measure. Higher educational institutions have historically looked at costs in the context of revenues rather than as part of their overall production functions. As a result, they often engage in temporary rather than sustained cost-cutting and only when there are shortfalls in revenues. Accomplishing real productivity increases will require a focus on resource use and outcomes, to ensure that quality and access are not degraded when costs are cut. This will require new habits within higher education’s administration, including better measures of productivity over time (Wellman, 2005).

One of the key weaknesses revealed in this literature review is the lack of a comprehensive, integrated approach to asset management that recognizes the relationship between factors at the state, institutional and project levels and the outcomes of student housing programs at public universities. This research supports the development of a performance measurement framework that will allow state colleges and universities to manage their public infrastructure assets more effectively.

The present study fills the gap in research by providing quantitative measures of how PPPs can create public value. Its purpose is to determine if PPP arrangements create

public value in the development of student housing at public colleges and universities by delivering units more quickly than the traditional state capital procurement process. If the timeline for cash flows can be accelerated, this will have a positive impact on a project's financial (Time Value of Money) position and social (Time Value of Service) impact.

Another missing piece in the literature lies in the lack of quantitative measures that demonstrate the effect of state regulation on capital project outcomes at public universities. To some degree, the state regulatory environment can be characterized by a tension between the need to protect taxpayers' interests and the autonomy required for state universities to stay on mission. However, it appears that some states might be "over-regulating" their public universities (Wolf, 1993). The disutilities caused by this over-regulation can have an adverse impact on public universities at multiple levels. The literature offers no mechanisms by which the impact of this regulatory dysfunction might be measured in the context of building new social infrastructure. In this regard, PPPs provide a way for public universities to opt out of the regulatory regime in order to avoid certain elements of this dysfunction. This research offers both a context in which to measure the impact of this dysfunction (i.e., Project Completion Time on new residence hall construction projects) and a variable by which it can be measured (Regulatory Status).

Finally, there is a marked lack of literature on the effects of student housing plans on institutional performance. Although there are strong indications that student housing plans are slowly being adopted as a best practice by state universities, this trend appears to be supported only by anecdotal evidence and conventional wisdom. There has been no

work done to measure the effects of having a student housing plan on operational performance. Chapter Four presents some empirical evidence that student housing plans do matter from an efficiency perspective.



## CHAPTER THREE

### RESEARCH METHODOLOGY

#### 3.1 Introduction

This is a mixed methods study which employs several qualitative and quantitative tools for data collection and analysis. A focused examination of the literature was used to explore the foundational thinking and the most recent findings regarding public-private partnerships, government reform and planning in the context of the development of new student housing at public universities. The literature review and several initial interviews were synthesized into a conceptual framework and a set of research questions. A sample frame consisting of all 1862 land-grant colleges was developed and a census was performed to collect data on residence hall projects completed within the past 14 years. From this census, a quasi-random sample of projects was selected for which subsequent data requests were made regarding the variables of interest to this study. Based on this data, simple and multiple regression analysis was used to answer the research questions by demonstrating the significance of the relationship between the independent variable, the intervening variables and the dependent variable, Project Completion Time. Finally, a multiple embedded case study analysis was used to strengthen the external validity of the study's findings.

This study addresses five research questions. They are as follows:

1. To what extent does the use of a PPP as a contract procurement method affect the completion time for a new, on-campus student housing project?

2. To what extent does the state policy environment affect the completion time for a new, on-campus student housing project?
3. To what extent does the fact that an institution of higher education has a student housing plan affect the completion time for a new, on-campus student housing project?
4. How do these three important variables work in combination to affect project completion time?
5. To what extent do the aforementioned variables affect project productivity (efficiency)?

Section 3.2 provides an overview of the conceptual framework used to develop the research questions and guide the methodology on which this study is based. Section 3.3 describes the data sources from which the universities used in this study were selected. Section 3.4 covers the data collection process for both the qualitative and quantitative information used. Section 3.5 discusses the comparative case study methodology used to complement the findings from the least squares analysis. Section 3.6 covers the procedures followed to ensure the validity and reliability of the evidence revealed in this research. Lastly, Section 3.7 offers a conclusion which summarizes the goals and expectations of the research design.

### 3.2 Conceptual Framework

Through a comprehensive literature review and conversations with industry experts the generalized conceptual framework shown in Figure 3.1 was developed. A conceptual framework is comprised of the variables and relationships that form the causal context of the research design (Mayer & Greenwood 1980). The conceptual framework for this study represents the concepts and relationships that influence the policy objective of completing a student housing project in a manner that responds effectively to market demand. The concepts reflected in the model were subsequently refined after an interview with Lee White (Interview granted December 7, 2011), Executive Vice President of George K. Baum & Company, a boutique investment bank that specializes in non-recourse financing of student housing projects, and conversations with Paul Williams (Interview granted March 14, 2011), Executive Director of the Dormitory Authority of the State of New York (DASNY), a state agency whose primary focus is the development of residence halls at public universities. The researcher further validated the model in conversations with other industry professionals, state government officials, college administrators and members of the researcher's dissertation committee.

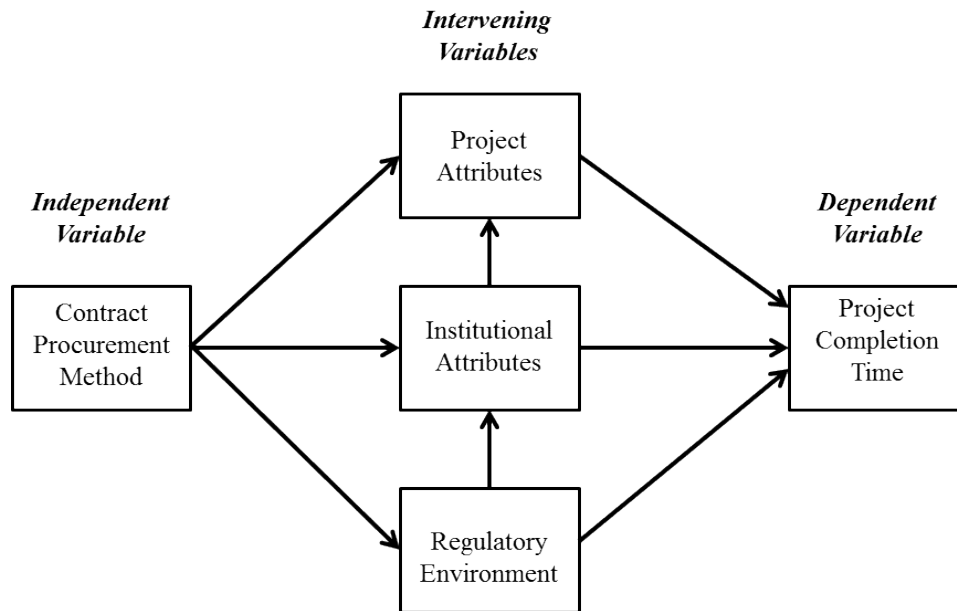


Figure 3.1: Generalized Conceptual Framework Relating Contract Procurement Method to Project Completion Time for the Construction of New Student Housing

The model reflects the hypothesis that the effect of using a public-private partnership (PPP), as one type of Contract Procurement Method (CPM), on Project Completion Time is influenced by attributes inherent to the state regulatory environment, the institution and the project. In addition, the model illustrates that the regulatory environment has a direct influence on the institution (e.g., increased levels of bureaucracy might affect university processes) and the institution has a direct effect on the project (e.g., the university’s mission might guide a facility’s design features).

### 3.3 Description of Data Sources

The study relied on several sources for its institutionally-related and project-related data. These included the Baum Higher Education Database (Baum, 2011), the

Carnegie Classifications Data File (Carnegie, 2011), the Association of Physical Plant Administrators of Universities and Colleges (APPA, 2012) online membership directory, and interviews and contacts with 91 college, industry and government personnel. The Baum and the Carnegie databases were used to identify attributes of student housing projects and public universities that might be helpful in selecting the final sample. In addition, the Baum database (Baum, 2011) and the APPA directory (APPA, 2012) were useful in the identification of census respondents and service providers who might have information relevant to the study.

For more than ten years, George K. Baum & Company's National Higher Education Finance Group has compiled an extensive nationwide database of financial information on non-recourse financed (where PPP arrangements were involved) student housing projects at both public and private institutions of higher education. The database includes facts collected from 300 student housing bond issues. Information includes school name, state, project name, investment banker participation, developer used, bond issuing entity, number of beds and units built, credit ratings from Moody's Investors Service and Standard & Poor's, credit enhancements provided and debt issue size. The database was used to identify state-level trends in the adoption of PPPs as a contract procurement method. A list of 23 PPP projects at 1862 land-grant universities was extracted from the Baum file. This provided an initial working file of projects to investigate. However, because this sample was too small (23 projects), it was decided to perform a census on all 1862 land-grant schools.

The Carnegie Classifications Data File was used to create a list of all 1862 land-grant universities for which a census could be conducted. This file includes information on more than 4,000 public and private colleges and universities in the U.S. This database was used to identify all of the 1862 land-grant universities and compare their attributes. The Carnegie Database maintains information on 84 descriptive variables related to every two- and four-year college and university in the United States. The information provided on the institutions listed within each classification represents a time-specific snapshot of institutional attributes with data from 2008 and 2010.

The APPA online membership directory provided information that enabled the researcher to make initial contact with schools in order to collect project-specific information. APPA is an association of college and university facility managers. The association's online membership directory lists the names and contact information for members at more than 500 colleges and universities nationally.

Ultimately, the decision was made to focus on 1862 land-grant colleges to control for institutional-level variables. As all but three<sup>19</sup> of the 1862 land-grant universities are similar in enrollment size (average 27,174 students), research orientation (all were high or very high in the relative amount of sponsored research performed) and status as a residential campus (all primarily residential), this group was selected in order to control for the possible effects of institutional differences in the sample frame in the final model.

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<sup>19</sup> Exceptions include the University of Alaska Fairbanks, the University of Maine and South Dakota State University.

### 3.4 The Data Collection Process

#### 3.4.1 Qualitative Data Collection

The research relied on qualitative and quantitative data sources. Email contacts and phone interviews were used to administer the email census. Follow-up email contacts and phone interviews were used to validate the accuracy of the information collected and to provide additional insights on the findings. Table 3.1 illustrates the number and type of contacts that were made. There were interviews and email contacts with 91 individuals from the university, industry and state government sectors. These conversations and communications provided the initial data for the census as well as qualitative content to support the study's findings.

<u>Organizational Role</u>	<u>University</u>	<u>Industry</u>	<u>Government</u>	<u>Total</u>
Finance & Administration	19	10	8	37
Facilities & Development	33	6		39
Governance	7			
Housing	6			6
Faculty	2			2
Total	<u>67</u>	<u>16</u>	<u>8</u>	<u>91</u>

Table 3.1: Total Number and Organizational Role of Contacts Made to Support Research

A total of 91 contacts were made to gather information related to this study, including 67 from universities, 16 from industry and eight from government. Information collected in interviews and correspondence with members from all of the aforementioned categories was critical in the completion of the census process mentioned in the following section, as well as in the development of the case studies covered in Chapter Five.

### 3.4.2 Quantitative Data Collection

The primary unit of analysis for this study is the student housing project. In order to collect project-specific information, the data collection effort focused on 48 of the 51 public land-grant institutions created by the Morrill Land-Grant Act of 1862. While there are other institutions created by amendments to the Act and subsequent related legislation, only the institutions created under the 1862 legislation were included in the census because of their similarity in a broad number of characteristics as mentioned earlier. In contrast to the historical focus of private colleges on liberal arts and religious studies, the original mission of the land-grant institutions as set forth in the 1862 Act was to focus on a curriculum based on practical agriculture, science and engineering in response to the industrial revolution and the changing social class status of those seeking higher education (Morrill Act, 1862).

There are 51, original 1862 land-grant schools, one for each of the 50 states and one for Puerto Rico. Cornell University (New York State) was eliminated from the data set because, although it is an original 1862 land-grant school, it is now a private institution. The University of Puerto Rico was eliminated from the data set because it is not located in a US state, a fact which might adversely influence data consistency in matters related to state regulatory environment. With three exceptions, as noted below, the remaining state institutions are all large (average total enrollment of 27,174), non-urban, research universities with predominantly residential campuses. The land-grant schools that exhibit an exception to these general characteristics are the University of



Alaska at Fairbanks, the University of Maine and South Dakota State University, which are all considered medium-sized campuses. Unfortunately, Mississippi State University is a land-grant university that is not a member of the association. Multiple attempts to reach a representative from facilities management at that school were made by phone but were unsuccessful. Therefore, no project information was obtained from this school. See Table 3.2 for additional attributes shared by the 1862 land-grant schools.

	<u>Individual Schools</u>					<u>Group Total</u>
	<u>Average</u>	<u>Median</u>	<u>Std Dev</u>	<u>Min</u>	<u>Max</u>	
Total Enrollment	27,174	25,029	11,945	9,137	55,014	1,385,849
Undergrad FTE	19,649	18,143	8,393	5,085	39,025	1,002,117
Full-Time Faculty	1,579	1,435	796	519	3,305	80,513
Entering Undergrads	5,545	5,256	2,002	2,499	9,648	282,808

Table 3.2: General Characteristics of Land-Grant Schools Included in Survey Sample Frame

The APPA database was used to retrieve contact information for real estate facilities personnel at 48 universities<sup>20</sup>. An email was sent to the senior individual (e.g., vice president or director of facilities) indicated in the APPA membership data base for each school in the list with a blank survey attached. See Appendix B and C for copies of the email and the census (survey) instrument that were used.

In the email, it was requested that the school representative contacted provide the data on all dormitories built after 2000. This time segment was chosen as it reflects a

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<sup>20</sup> The final sample frame of 48 schools was derived from the original set of 51 schools by removing the University of Puerto Rico, Cornell University and Mississippi State University.

period of major growth in the use of PPPs for student housing projects according to the Baum database (Baum, 2011). This time period was also chosen because it would be challenging to find key personnel who had been working at a given university while projects completed before 2000 were being built. While the initial focus was on student housing projects completed after 2000, the time span was expanded to 1998 to accommodate the willingness of UC Davis to provide some singularly detailed insights on the Primero Grove PPP project. One or more follow-up telephone calls were made to facilitate census completion and to validate the information provided from the e-census. In most instances, the initial person contacted required assistance from other campus personnel to fully complete the census.

Responses for 43 student housing projects were received and analyzed from 12 universities. Fourteen schools initially responded to the census (i.e., a 29 percent response rate). Of the 14 responding schools, two, the University of Alaska at Fairbanks and the University of Tennessee noted that they had not built any dormitories within the indicated time period. Of the total 44 project forms completed, one project was eliminated from the list provided by the University of Maryland. The calculation of the Project Completion Time for one dormitory was unrealistically low and could not be confirmed at the time of the original data request<sup>21</sup>. Therefore, the final sample includes 43 projects. Many of the responding schools had completed more than one student housing project over the period in question. See Table 3.3 for a summary of survey responses.

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<sup>21</sup> Further inquiries regarding the data requested for the eliminated project at the University of Maryland will be made at a future date.

<u>State</u>	<u>School</u>	<u>Projects</u>		<u>Total</u>	<u>Beds</u>	<u>GSF</u>
		<u>Traditional</u>	<u>PPP</u>			
Alabama	Auburn	8	0	8	1,630	673,687
California	UC Davis	8	2	10	2,086	719,913
Georgia	U. of Georgia	0	5	5	1,756	697,469
Hawaii	U of Hawaii	1	0	1	810	196,278
Kentucky	U of Kentucky	4	0	4	663	265,000
Maryland	U. of Maryland - College Park	0	7	7	2,625	933,115
So. Carolina	Clemson	1	0	1	296	73,975
Texas	Texas A&M	2	0	2	980	403,960
Virginia	Virginia Tech	1	0	1	260	92,800
W. Virginia	W. Virginia U.	1	0	1	367	91,636
Washington	Washington State	1	0	1	230	89,000
Wisconsin	U. Wisconsin-Madison	1	1	2	1,040	377,000
<b>Total</b>		<b>28</b>	<b>15</b>	<b>43</b>	<b>12,743</b>	<b>4,613,833</b>

Table 3.3: Summary of the Land-Grant College Survey Responses

The census of the 48 public universities resulted in a quasi-random sample of 43 projects. The elements of the project selection process which made it random were the fact that (1) the sample was the result of a 100 percent census which means that the selection of institutions was unbiased; and (2) the structure and efficacy of the institution-specific facilities departments through which the data requests were processed can be assumed to be randomly distributed. One unknown factor which could affect the randomness of the sample is the propensity of a more (or less) well-organized administration to complete the census survey. However, certain steps were taken to mitigate the risk that the quality of the data might be adversely affected by a systematic bias. These included the follow-up procedures that included phone calls and emails to multiple parties at the project, institutional and state levels who were involved with a given project (e.g., regulatory personnel, administrators in president's and board of

trustees’ office, planning officials, professionals related to the project, etc.) and the reliance on archival documentation. See Table 3.4 for a descriptive statistics of the sample database.

<b>Panel A: Total Sample</b>							
<u>Factor</u>	<u>Units</u>	<u>Mean</u>	<u>Median</u>	<u>Standard Deviation</u>	<u>High</u>	<u>Low</u>	<u>Number</u>
Project Completion Time	Days	966	770	578	3,640	224	43
Number of Beds	Beds	296	246	152	810	144	43
Gross Square Feet	Square Feet	107,298	92,800	61,453	330,823	35,720	43
Gross Square Feet/ Bed	Square Feet	368	364	139	1,096	203	43
Average State Population	Millions	13.28	5.54	12.90	35.56	1.29	43
State Student Growth	Percent	27%	24%	8%	43%	13%	43

<b>Panel B: PPP Projects</b>							
<u>Factor</u>	<u>Units</u>	<u>Mean</u>	<u>Median</u>	<u>Standard Deviation</u>	<u>High</u>	<u>Low</u>	<u>Number</u>
Project Completion Time	Days	623	679	175	855	224	13
Number of Beds	Beds	370	370	130	704	217	13
Gross Square Feet	Square Feet	137,891	122,036	63,679	330,823	74,766	13
Gross Square Feet/ Bed	Square Feet	371	363	69	499	252	13
Average State Population	Millions	6.84	5.54	1.66	8.94	5.53	13
State Student Growth	Percent	28%	24%	8%	38%	15%	13

<b>Panel C: Traditional Projects</b>							
<u>Factor</u>	<u>Units</u>	<u>Mean</u>	<u>Median</u>	<u>Standard Deviation</u>	<u>High</u>	<u>Low</u>	<u>Number</u>
Project Completion Time	Days	1,115	1,011	626	3,640	377	30
Number of Beds	Beds	265	222	150	810	144	30
Gross Square Feet	Square Feet	94,042	70,000	55,448	234,551	35,720	30
Gross Square Feet/ Bed	Square Feet	366	364	160	1,096	203	30
Average State Population	Millions	16.07	5.07	14.55	35.56	1.29	30
State Student Growth	Percent	26%	28%	9%	43%	13%	30

Table 3.4: Descriptive Statistics of the Sample Database<sup>22</sup>

<sup>22</sup> According to the operational definition of a PPP used in this research (i.e., project development sourced outside of the traditional state procurement process and using a private partner with project ownership), there were only 13 PPP projects. However, at UC Davis, there were two projects sourced through the traditional process that were completed by private partners that owned and managed the buildings at completion. These two projects at UC Davis were not coded as PPPs, even though they are in all other

### 3.4.3 Archival Document Collection

Archival documents were used to support the calculation of the dependent variable, Project Completion Time. Minutes of meetings of the board of trustees were collected to provide evidence of the date when a resolution was passed to move a project forward. In most cases, minutes were available online. In other cases they were provided by the secretary to the board of trustees or administrators supporting the board of regents. The collection of this information was facilitated by the fact that all of the institutions in the census were agencies of their respective states and the information requested is available to the public through the Freedom of Information Act. Certificates of occupancy (or certificates of substantial completion) were collected from university personnel responsible for facilities and building safety. In most cases, these certificates were available in local files. However, for older projects, special requisitions were required from off-site storage facilities. The dates on these archival documents were used to determine (or confirm) the respective dates of project approval and completion. In the event that either of these two types of documentation was not available, other administrative records were used to confirm dates of project approval and completion (e.g., move in dates, construction documents, etc.).

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aspects except for the procurement process. They are coded as traditional projects because the focus of this research is on the impact of Contract Procurement Method on Project Completion Time.

### 3.5 Least Squares Regression Analysis

#### 3.5.1 Model Development

The study used a simple least squares regression analysis to determine the strength of the relationship between Project Completion Time (PCT) as a dependent variable and Contract Procurement Method as an independent variable. A similar analysis was used to determine the strength of the relationship between PCT and Regulatory Status and PCT and Plan, respectively, as intervening variables.

The analysis also included multiple regression models to determine how the Contract Procurement Method, Regulatory Status and Plan variables interact with each other and with other contract-, project-, institutional- and state-level intervening variables to influence the dependent variable Project Completion Time. This model relied on a five percent level of significance for each coefficient to determine which variables suggested a strong relationship with Project Completion Time. Finally, these same independent and intervening variables were used in a second multivariate regression model to determine their influence on the dependent variable Project Speed<sup>23</sup>, which serves as a proxy for project efficiency.

#### 3.5.2 Hypotheses

The aforementioned regression models were used to answer the research questions developed in Chapter One. The literature is mixed regarding whether or not the use PPPs shortens project completion time. Savas (2000) presents evidence that the

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<sup>23</sup> Project Speed = Total Project Gross Square Feet/ Project Completion Time = Gross Square Feet/Day

construction completion time is shorter when PPPs are involved. Other research refutes this claim (Hellowell & Pollock, 2010). However, there is limited research on the effect of government regulation in higher education and the existence of student housing plans on either project completion time (the dependent variables that encompasses an expanded definition of project duration introduced in this research) or worker efficiency. A major contribution of this research is its analysis of the impact of state government regulation and asset management policies at public universities on project duration (Project Completion Time) and worker efficiency (Project Speed).

The least squares analyses test the following five hypotheses that correspond to Research Questions one through five, respectively:

Hypothesis 1: The use of PPPs in the development of student housing projects will result in a lower Project Completion Time than when the traditional contract procurement method is used.

Hypothesis 2: Project Completion Time will be longer for student housing projects in states where the higher education regulatory agencies have budgetary and/or program approval authority.

Hypothesis 3: Project Completion Time will be shorter for student housing projects at public universities with a student housing plan.

Hypothesis 4: Contract Procurement Method has significant influence on Project Completion Time in an interactive way with state government-level, university-level and project-level factors.

Hypothesis 5: Contract Procurement Method has a significance influence on Project Speed (as a proxy for efficiency) in an interactive way with state government-level, university-level and project-level factors.

### 3.6 Comparative Case Study Analysis

In order to validate the findings from the multiple regression model detailed above, four projects from two universities were analyzed. The use of comparative case methodology in public administration research and policy analysis is a long-standing practice. Pressman and Wildavsky's landmark policy study, *Implementation* (1973) was based on a single case study. Yin (1984) notes that multiple case designs yield evidence that is often more compelling than the single case and often considered to be more robust. The comparative case approach uses detailed scenarios to investigate phenomena within their institutional context and then to analyze them by comparison (Agranoff & Radin, 1991).

The research design focused on two institutions, the University of South Carolina Upstate and the University of Wisconsin Madison, examining key elements of the higher education regulatory environment within each of the respective states and specific operational dynamics at the project level. In addition, the analysis compared the schools on several key institutional factors. The case analysis used the sequence of steps suggested by Agranoff and Radin (1991) as follows:

1. ***Development of major concepts and research questions.*** The same literature review, conceptual framework and research questions used to develop the



least squares model for the quantitative analysis was used to develop the case study methodology.

2. ***Case site selection.*** After an examination of the literature and developing a conceptual framework, four cases were selected for their potential in helping to generalize the findings from the quantitative analysis to other types of institutions. The relationship observed between the PPP and traditionally procured dormitory projects at the University of Wisconsin Madison (an 1862 land-grant college) reinforces the larger study's findings. However, the University of South Carolina Upstate is a much smaller school with substantially different campus and cultural characteristics from the land-grant colleges in the larger study. The fact that the University of South Carolina Upstate experienced outcomes similar to the University of Wisconsin Madison and to the overall findings of the least squares analysis suggests that the research might be generalizable across all public institutions of higher education. This analysis helps to eliminate the possibility that the observed relationship between PPPs and Project Completion Time among the 43 projects in the sample might be the result of institutional differences only.
3. ***Site visits, interviews and data collection.*** Data was collected over a one-year period. In the case of the University of South Carolina Upstate, the collection process took place during the summer of 2011 as part of a pilot study. The researcher visited the site and interviewed the Vice Chancellor, USC Upstate, Robert Connelly, who was the key figure involved on each of the two

projects. Subsequent interviews were granted and email correspondence was exchanged between the researcher, the office of the State Engineer and the President of the USC Upstate Foundation. The researcher was able to develop the concept of “elapsed time to project completion” which ultimately became the dependent variable, Project Completion Time. In addition, archival documents were obtained which provided a deeper understanding of the interagency dynamics and to help quantify the impact of the decision-making processes. Key information was obtained from the University of Wisconsin Madison through telephone interviews with Michael Kindermann, Director of Capital Planning, and conversations and email exchanges with other state and university officials.

4. ***Case development.*** A template was used to ensure consistent treatment of the case findings and to contribute to the general analysis of research questions. The following points were included in the template to ensure consistent treatment of findings for each case: a) overview of regulatory interfaces; b) overview of school attributes; c) project overview - PPP; d) rationale for PPP (including key decision processes and project accomplishments) and e) project overview – traditional contract procurement method.
5. ***Cross-case analysis.*** The cases were used as a new database from which a subset of the research questions could be analyzed using major themes identified in the outline as key links in the chain of evidence that supported (or refuted) the findings of the quantitative analysis.

This comparative, embedded case study research design provided an opportunity to focus on how the unique qualities of the selected institutions and the state-specific regulatory environments affect the project outcomes. Each case included a PPP and a traditional project. In addition to the aforementioned techniques, the study used pattern matching, explanation building and an analysis of competing explanations to compare the two case studies. The goal was to provide a new, more detailed context for the consideration of the aggregate patterns observed in the quantitative study. As such, this analysis complements the quantitative analysis and reinforces its findings.

### 3.7 Test of Research Quality

The quality of empirical social research is commonly established on the basis of four tests: (1) construct validity; (2) internal validity; (3) external validity; and (4) reliability (Singleton & Straits, 2010).

#### 3.7.1 Construct Validity

Construct validation is the process of ensuring that the correct operational measures for the concepts being studied are employed. The key concepts under consideration are Project Completion Time (the dependent variable) and Contract Procurement Method (the independent variable). To ensure construct validity, the current research used multiple sources of evidence, initially relying on data collected through interviews then reviewing archival documents (e.g., board of trustee meeting minutes, certificates of occupancy, etc.) to verify the nature of the relationship between the

developer and the university and to confirm the accuracy of the data provided for the project census. The data collection process was organized so as to establish a chain of evidence to support the measure of Project Completion Time.

In addition to the use of the convergent data collection methods described above, a draft of the completed research was shared with Lee White, Executive Vice President of George K. Baum & Co. and Paul T. Williams, Executive Director of the Dormitory Authority of the State of New York to validate the research findings.

### 3.7.2 Internal Validity

The process of internal validation seeks to confirm the existence a causal relationship between the independent variable, Contract Procurement Method (CPM), and the dependent variable, Project Completion Time (PCT). Perhaps the strongest indicators of internal validity are the results of the least squares regression analysis in determining the statistical significance of the relationship between CPM and PCT. The research also determined that the evidence converges across the quantitative (i.e., least squares regression) and qualitative (i.e., case study) research. The research also examined rival explanations for the decrease in project duration when PPPs are used for new student resident hall construction and found them to lack the same level of robustness as those presented through the regression analysis.

In addition, the case study analysis performed in Chapter Five used a pattern matching technique to ensure internal validity in the qualitative research. This technique included a cross-case analysis to identify patterns across the four cases in order to

substantiate the research propositions listed in Chapter One. The fact that the patterns coincided, helped to strengthen the claim that a causal relationship existed between the independent and dependent variables. Patterns were noted with respect to changes in the dependent variable (Project Completion Time) in the presence of certain types of government regulation and with the presence of public-private partnerships. Patterns observed in the case study analysis supported the relationships observed between the dependent variable PCT, the independent variable, CPM, and the intervening variable, RegStat, in the statistical analysis discussed in Chapter Four.

As part of the case study analysis, an explanation building procedure further reinforced the internal validity of the overall research. This included the use of logic models that matched empirically observed events to theoretically predicted outcomes. The logic models illustrated the cause and effect relationships between events and outcomes that served as the building blocks of the phenomenon under investigation. Finally, a cross-case synthesis was included as a part of the case study analysis to support the development of a logic model. The researcher created word tables that display the data from the individual cases according to a uniform framework (see Chapter Five, Tables 5.1 and 5.2).

### 3.7.3 External Validity

External validity is the ability of the study's findings to be generalized within and beyond the domain in which it has been defined. As the result of a triangulation of multiple data sources and multiple methods, the research findings should be highly

generalizable to all 1862 land-grant universities and moderately generalizable to public four-year institutions in the U.S.

The embedded, multiple-case analysis provided an analytical generalizability that complemented the statistical generalizability of the survey research and the least squares analysis used to characterize the same phenomenon (i.e., CPM-PCT relationship). The case research employed a replication logic technique in its embedded, multiple-case approach. It compared a small, rural state college campus in South Carolina (University of South Carolina Upstate) with a large flagship campus in Wisconsin (University of Wisconsin Madison) to demonstrate that the same logic applies to a public university outside of the population evaluated in the quantitative study (i.e., 1862 land-grant universities). The rationale for using replication logic is the same one that underlies the use of multiple experiments to allow scientists to accumulate knowledge across experiments.

#### 3.7.4 Reliability

Research is deemed reliable to the extent that the operations of a study (e.g., such as the data collection procedures, model building, case analysis, etc.) can be repeated, with the same results. To ensure the reliability of the study, the researcher has kept a record of the protocols used (e.g., model-building steps, case study template, etc.) and maintained a database of contacts and archival documents (e.g., names and contact information of interviewees, board minutes, etc.).

### 3.8 Conclusion

The objective in choosing the research strategies and protocols outlined here was to develop a grounded theory on the use of PPPs in the development of student housing in public higher education in the United States. By following a multiple methods approach in the collection and analysis of data related to the development of student housing at public universities, the current study introduces new concepts related to the interaction between certain characteristics of the state regulatory environment for higher education and the ability of PPPs to contribute to an institution's mission in a quantifiable manner.

Grounded theory is inductively driven from the study of a given phenomenon. The researcher, rather than commencing with a theory which he or she attempts to verify, commences with an area of study and allows relevant theoretical constructs to emerge from that process of study (Glaser & Strauss, 1967). This allows an intrinsic relationship to develop between the data and the theory. A grounded theory is not deduced from some general theory before beginning research, but is discovered in the data during the research process (Yin, 1991). Theoretical and empirical activities are tightly interwoven in order to benefit from each other and advance the growth of insight. While grounded theory is considered a qualitative research tradition, Glaser and Strauss (1967) suggest that the principles can also be used in quantitative research.

This research was designed to answer the five aforementioned research questions with valid, reliable evidence. This evidence is strong enough to withstand the scrutiny of the social scientific research community. In addition, it reveals key policy implications and points to possible interventions that might allow scholars in the field of public policy

research, university administrators and state regulators to jointly create stronger public institutions of higher education and more effective governance structures.



## CHAPTER FOUR

### DATA ANALYSIS AND RESULTS

#### 4.1 Introduction

The experience of land-grant universities with public-private partnerships in building new student housing offers an extraordinary insight into the potential for the use of this contract procurement method (e.g., project delivery method) in the development of other infrastructure types. This chapter outlines the data analysis and results of several models relating contract procurement method to project duration (Project Completion Time) and efficiency (Speed). This study employed a least squares analysis using a sample of 43 different projects at 14 schools in the same number of states. The results confirm that PPPs decrease project duration to a significant degree.

This chapter is divided into four sections. First, Section 4.2 provides an overview of the independent and intervening variables utilized in the research models. Previously, the data gathering and methodological issues for this quantitative research was covered in Section 3.4.2. Second, Section 4.3 describes the dependent variables used in the study. The dependent variables “Project Completion Time” (PCT) and “Speed of Project Completion” (Speed) are derived from similar, construction-related variables found in the construction science literature. Section 4.4 reviews the research findings based on the research models relating the dependent variables to the independent and intervening variables. Each of the first four research questions are addressed in sub-sections 4.4.1 through 4.4.5, with the fifth question addressed in subsection 4.4.6. Section 4.5 provides a conclusion to the chapter.

## 4.2 Independent and Intervening Variables

This section summarizes the attributes of the independent and intervening variables of interest to this research. The thirteen variables were chosen because of their usefulness in previous studies with closely related topics and outcomes (Atkinson, 1999; Belassi & Tukel, 1996; Chan & Chan, 2004; Glenny & Schmidlein, 1983; Kaganova & Polen, 2006). It is the relationship between the independent variable, Contract Procurement Method (CPM), and the dependent variable, Project Completion Time (PCT), that is the primary focus of this study.

### 4.2.1 The Independent Variable

College administrators at public universities have two procurement options available for building new student housing facilities. They can choose to use the traditional state procurement process or enter into a public-private partnership arrangement. Under the traditional state procurement option, the institution's planning team justifies the need for a new housing facility and then the senior management team and governing board (e.g., president, board of trustees, etc.) approves the project. The capital project request is then submitted for review and approval to one or more state agencies depending on the governance structure within that state.

The alternative procurement method is to pursue the development of a student housing project through a public-private partnership. For the purposes of this research, the operating definition of PPP is the Design-Build-Finance-Own agreement. Using this method, the public institution is able to avoid many of the additional approval steps

required in the traditional procurement process. The presumption of this analysis is that by choosing the PPP path to develop a new student housing project, the school will be able to complete its housing project more quickly, with all other conditions held constant. The Contract Procurement Method is represented as an indicator (dummy) variable in the model. A value of (1) indicates a PPP arrangement was used and a value of (0) indicates a traditional state procurement process was used. Table 4.1 shows that 30% of the total projects in the dataset were PPPs and that 70% were not.

<b>Description</b>	<b>Measures</b>	<b>Type</b>	<b>Metric</b>	<b>%PPP</b>	<b>% Non-PPP</b>
CPM	Contract Procurement Method	Qualitative	PPP (1) vs Traditional Procurement Process (0)	30.2%	69.8%

Table 4.1: Information on the Independent Variable “Contract Procurement Method”<sup>24</sup>

#### 4.2.2 Intervening Variables Associated with State Government-Level Attributes

Intervening variables are variables that can allow a more thorough understanding of the relationship between an “independent variable of interest” and dependent variables. In this study, it is assumed that the relationship between Contract Procurement Method

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<sup>24</sup> Contract Procurement Method (CPM) refers to the choice faced by university personnel to either source development contracts through the traditional state construction procurement process where the school owns the property or to use a PPP where the private partner owns the property upon completion. There were two cases at UC Davis where a college worked with a private development partner but sourced the contract through the state process (i.e., competitively bid for a partner to own and operate the facility). To accommodate for arrangements where the traditional contract procurement process resulted in a PPP agreement, a new variable, REL, was introduced where a “1” implied a PPP relationship and a “0” indicates a vendor relationship. As a result, there are only three possible sets of CPM, REL value combinations: (0,0), (1,1) and (0,1).

and Project Completion Time is influenced by specific state, institutional and project-level variables.

The conceptual framework considers several intervening variables that reflect state-level influences. The concept of “state regulatory environment” specifically refers to the various systems, procedures and political processes involved with the state-level oversight and governance of higher education. This does not include the governance at the university-level (e.g., board of trustees). The state regulatory environment includes all of the arrangements for regulating, coordinating and funding post-secondary education in the state that exist outside of the university’s administrative domain. While Hearn and Griswold (1994) distinguish between three basic types of state regulatory structures for higher education (i.e., consolidated governing boards, coordinating boards and planning agencies), the key information considered for this variable was whether or not the state regulators had the authority to approve the budget of capital projects at public universities. This study tests the alternative hypothesis that student housing project completion times are longer (i.e., measured in days) in states where regulators do have budgetary approval authority over projects at the university level, creating a potential for what is labeled here as regulatory drag on the procurement process. Appendix F contains a listing of the budget approval authority levels of all U.S. state boards of higher education.

A one-level dummy variable, Regulatory Status (RegStat), was used as a proxy for the effect of a state’s higher education regulatory structure on Project Completion Time. A value of (1) indicates a state regulatory environment where final capital budget

approval authority rests outside of the institution was used and a value of (0) indicates a state where the university has the final say regarding when and how a dormitory project moves forward. The data detailed in Table 4.2 indicate that 100 percent of the PPPs (i.e., where the traditional procurement process was not used) were in states where regulators had budgetary authority.

In addition to regulatory environment, other state-level variables considered were the average state population between 2000 and 2010 (Avg Pop) and the percent change in college student population in the state between 2000 and 2008, as determined by the 2010 U.S. Census (%StudGrwth). Average state population size was selected because the assumption was that the larger the state population, the more complex the regulatory environment, the more likely there would be non-market failures and the more likely public universities would seek PPPs as an alternative to procuring projects through the state procurement process. Average state population demonstrated a strong correlation to the number of PPPs by state at the one percent level of significance ( $R^2 = .562$ ). The Analysis of Variance showing the strength of the relationship between average state population and the number of PPPs in that state is shown in Appendix D. Because of the strength of the relationship apparent between state population size and the number of PPP projects at state universities, this research included average population as an intervening variable to test with respect to the independent variable Project Completion Time.

Percent student growth was considered as a potentially promising intervening variable because of the assumption that the larger the percentage growth in the state's college-age student population, the more pressure state university administrators might

feel to build housing to accommodate new demand. While the relationship between student population growth and the number of PPPs in the state was not supported in a simple least squares regression analysis, it is apparent that the accommodation of student growth has become a problem at some universities (Rivera, 2012). As a result, the variable %StudGrwth was still included in the multiple regression models to determine if its significance might emerge through interactions with other intervening variables. Table 4.2 lists the intervening variables examined that are related to state level attributes.

Description	Measures	Type	Metric	%		
				Total	PPP	Non-PPP
RegStat	State Regulatory Environment	Qualitative	Budget Approval (1)	58%	100%	40%
			No Budget Approval (0)	42%	0%	60%

Description	Measures	Type	Metric	Mean		
				Total	PPP	Non-PPP
AvgPop (Millions)	Average State Population 2000-2010	Quantitative	As given	13.28	6.84	16.1
%StudGrwth	% Student Growth 2000-2008	Quantitative	As given	27%	28%	26%

Table 4.2: Intervening Variables Associated with State Government-Level Attributes

#### 4.2.3 Intervening Variables Associated with University-Level Attributes

By limiting the sample to student housing projects at 1862 land-grant colleges, this research attempts to control for size, tax status (e.g., public, private or for-profit) and culture of an institution. Schools in the data set are all large (e.g., average enrollment of 27,174), public institutions, are members of the Association of Higher Education Facilities Officers (now called APPA since the association's recent name change), and

possess similar campus design and cultural attributes (e.g., Olmsted influence). As a result, the only intervening variable tested at the university level is whether or not the institution had a housing plan. Because of their affiliation with the Association of Higher Education Facilities Officers, the assumption is that administrators have exposure to a basic level of generally accepted campus facility management best practices. The research will attempt to determine whether the existence of a student housing plan is related to project completion time. A value of (1) indicates a university that has a student housing plan in place, as distinct from a master plan, and a value of (0) indicates one that does not have a student housing plan in place. Table 4.3 lists the attributes associated with the intervening variable, Plan.

In the model, “Plan” is a one-level indicator variable (dummy variable) that serves as a proxy for the type of real estate asset management environment that exists at the university level. Having a student housing plan (as separate from a campus master plan) in place is represented by a value of (1). Otherwise the value is (0). The aim of having this variable in the model is to determine if having a student housing plan in place influences the relationship between Contract Procurement Method and Project Completion Time. The data represented in Table 4.3 suggests that PPPs are somewhat more likely to be used by universities with a student housing plan in place.

Description	Measures	Type	Metric	%		
				Total	PPP	Non-PPP
Plan	Use of Dedicated Student Housing Plan	Qualitative	Yes (1)	33%	38%	30%
			No (0)	67%	62%	70%

Table 4.3: Intervening Variable “Plan” Associated with University-Level Attributes

#### 4.2.4 Intervening Variables Associated with Project-Level Attributes

The intervening variable “Beds” is a proxy for building size and the number of students the facility will house. Gross Square Feet (GSF) is another measure of building size. The hypothesis related to these measures is that the larger the building the longer it should take to complete. As more features are added to a project (e.g., dining hall, study rooms, etc.) the program complexity of the project changes. The variable GSF/Bed is a proxy for the project’s complexity. The hypothesis tested for this variable is that the more complex the facility (e.g., more features such as dining hall, study rooms and other types of common areas), the longer it should take to construct the project, all other variables held constant.

As detailed in Table 4.4, the PPP projects in this data set tend to be larger than non-PPP projects. The mean value for PPPs was 137,891 gross square feet versus 94,042 for non-PPP projects. The tendency for universities to use PPPs for larger, more complex projects is supported by interviews with school administrators (G. Van der Mey; Interview granted March 31, 2011).

The research also examined the relationship between materials used, design type and construction delivery method on Project Completion Time. The variable, Materials, reflects three levels of project quality. Buildings constructed using steel frames and concrete floors are considered to be of the highest quality. These structures were built to last for 70 – 100 years or more. Buildings constructed with wood framing and wood floors are considered to be of a lower quality and their life expectancy is more like 30 – 40 years. An intermediate level of construction quality was considered to be “hybrid”,



where concrete and steel are used at the lower levels to enable the creation of taller buildings. Wood framing and wood floors are used at the higher levels to enable more stories to be added. The expected lifespan of buildings made of these materials is 40 to 50 years. The alternative sub-hypothesis being tested with the materials variable is that project completion time as measured in days is impacted by the quality of the building materials used.

The sample data indicate that PPPs are more likely to be built using steel framing and concrete floors, while traditional dormitories are more likely to be built using wood framing and wood floors. Fifty-four percent of the PPP projects in the sample were built using steel-frame and concrete materials versus 33 percent of the traditional projects. Only eight percent of the PPP projects were built using wood framing and wood floors versus 57 percent of the traditional projects. This is a two-level indicator variable (two dummy variables in formula) that represents the three general configurations of building materials observed in the data: (1) steel-frame/concrete floors, (2) wood-frame/wood floors and (3) hybrid (i.e., steel-frame/concrete floors on lower levels and wood-frame/wood floors on upper floors). The indicator (dummy) variables used were as  $Materials_1$  and  $Materials_2$ . For structures made with steel-frame and concrete floors,  $Materials_1$  and  $Materials_2$  both equal (0). For structures made with wood framing and flooring,  $Materials_1$  equals 1 and  $Materials_2$  equals (0). For hybrid structures (i.e., those made with a combination of steel framing and concrete flooring on lower floors and wood framing and floors above),  $Materials_1$  equals (0) and  $Materials_2$  equals (1).

Design type is captured by the variable Style. Three levels of design have been considered in the model. The student housing projects were classified as apartment, suite or dormitory-style. Apartments have one or more bedrooms, one or more baths and a kitchen (or kitchenette) within the unit. Suites have bedroom sharing baths within the unit, but no kitchen. Students are expected to eat in dining hall facilities that may or may not be a part of the residential structure. Dormitory-style student housing has just one or more bedrooms in the units with “gang” bathrooms in the hallways that are shared by multiple living units. The three classes are represented by two indicator variables, Style<sub>1</sub> and Style<sub>2</sub>. The alternative sub-hypothesis tested for Style is that the style of the project has a significant influence on project completion time (e.g., the more complex the style [for example, additional plumbing required for added baths and kitchen in an apartment] the longer the time for completion). For apartments, Style<sub>1</sub> and Style<sub>2</sub> both equal (0). For suites Style<sub>1</sub> equals (1) and Style<sub>2</sub> equals (0) and for dormitories, Style<sub>1</sub> equals (0) and Style<sub>2</sub> equals (1).

The sample data indicate that there is a greater likelihood that PPPs will be used to build apartments rather than dormitory or suite-style residence halls. Fifty-four percent of the PPP projects in the sample data were apartments versus 37 percent of the traditional projects. It is of note that none of the PPP projects were suite-style units, while 30 percent of the traditional projects were built as suites.

Another project-level variable was “Construction Delivery Method” (CDM). Three types of construction delivery methods were observed in the sample data: Design-Bid-Build (DBB), Design-Build (DB) and Construction Manager at Risk (CMR). As with

Style, two dummy variables were used to reflect the three options for Construction Delivery Method, CDM<sub>1</sub> and CDM<sub>2</sub>. For projects completed using DBB, CDM<sub>1</sub> and CDM<sub>2</sub> both equal (0). For projects completed using DB, CDM<sub>1</sub> equals (1) and CDM<sub>2</sub> equals (0). For projects completed using CMR, CDM<sub>1</sub> equals (0) and CDM<sub>2</sub> equals (1). Sixty-two percent of the PPP projects were built using DB as a construction delivery method versus 20 percent of the traditional projects.

The variable Relationship is also represented by a dummy variable and indicates whether the relationship between the university and the developer is based on a vendor (0) or partnership (1) arrangement. While this variable is closely associated with Construction Procurement Method (CPM), there is a slight difference. Relationship reflects the nature of the university – developer relationship. Two University of California Davis projects (Primero Grove and the Villages at La Rue) were partnership arrangements, in that a private firm built and managed the residence halls. However, they were both procured through the traditional state procurement process (e.g., competitive bid). For the purposes of this analysis, both projects are considered PPP arrangements and receive a value of (1) because they reflect a partnership relationship between UC Davis and the respective private developer/operators. However, their value along the CPM dimension is (0) because they are procured through the traditional state process. Ninety-three percent of the traditional projects were built where developers held a vendor status.

The variable Management is also represented by a dummy variable and used to indicate whether the residence hall, once completed, will be managed by the university

(0) or a third party (1). The literature discusses efficiencies that can be captured when management operations are outsourced to private sector service providers (Gupta, Herath, & Mikouiza, 2005). In 54 percent of the sample projects, the PPP also managed operations after completion. Forty-six percent of the PPP projects were managed by their university partner after completion. To a large extent, this results from the fact that the developer was a university-related foundation that contracted with the university to manage the facility after its completion.

Table 4.4 lists the intervening variables associated with the project-level attributes and details some of the summary descriptive statistics for each variable in the data set.

Description	Measures	Type	Metric	Mean		
				Total	PPP	Non-PPP
Beds	Number of Beds	Quantitative	As given	296	370	265
GSF	Gross Square Feet	Quantitative	As given	107,298	137,891	94,042
GSF/Bed	Gross Square Feet/Bed	Quantitative	$X_2/X_1$	368	371	366

Description	Measures	Type	Metric	%		
				Total	PPP	Non-PPP
Materials	Construction Materials Used	Qualitative	Steel Frame & Concrete (0,0)	40%	54%	33%
			Wood Frame & Floors (1,0)	42%	8%	57%
			Hybrid (0,1)	19%	38%	10%
Style	Building Style	Qualitative	Apartments (0,0)	42%	54%	37%
			Suites (1,0)	21%	0%	30%
			Dormitory Style (0,1)	37%	46%	33%
CDM	Construction Delivery Method	Qualitative	Design-Bid-Build (0,0)	44%	0%	63%
			Design-Build (1,0)	33%	62%	20%
			CMR (0,1)	23%	38%	17%
Relationship	Government-Developer Relationship	Qualitative	Vendor (0)	65%	0%	93%
			PPP (1)	35%	100%	7%
Management	Provision of Dormitory	Qualitative	University (0)	79%	46%	93%
			PPP Partner (1)	21%	54%	7%

Table 4.4: List of Intervening Variables Associated with Project-Level Attributes

### 4.3 Dependent Variables

#### 4.3.1 Project Completion Time as a Measure of Performance

The research for this study defines a new variable derived from the concept of Construction Time. This new variable is called Project Completion Time. This is the primary measure of interest, the dependent variable, for the model described later in this section. See equation (4) for the calculation of Project Completion Time.

$$PCT = PCD - PAD \quad (4)$$

Where,

PCT = Project Completion Time is the number of days between project approval and building occupancy.

PCD = Practical Completion Date is the date on which the project receives its certificate of occupancy.

PAD = Project Approval Date is the date on which the project is approved by an institution's board of trustees.

The model uses Project Completion Time rather than Construction Time for two reasons. First, technically it is more difficult to measure Construction Time because of issues relating to Project Commencement Date. It is not unusual for developers to start working on a project before a contract is signed or approvals are received. For Design-Build projects, the architect and general contractor may begin their collaboration long before the project is actually bid. Therefore, determining a "hard" date for project commencement is a challenge.

Secondly, the introduction of the concept of Project Completion Time allows for an investigation of non-project related factors that might influence overall project performance. The two factors that are of particular interest in this research are the influence of regulation at the state level and of the asset management environment at the university level. Two key hypotheses tested in the quantitative analysis are that Project Completion Time will be longer for student housing projects in states where the higher education regulatory agencies have budgetary approval authority and shorter for student housing projects at universities with a formal student housing plan.

The ultimate aim of this research is to create an explanatory model that indicates the nature of the relationship between Contract Procurement Method (CPM) and Project Completion Time (PCT). Where possible, the researcher obtained copies of the Certificate of Occupancy (or Certificate of Substantial Completion) and the resolution of the Board of Trustees (or other appropriate governing body) which are archival documents used to determine the dates from which PCT was calculated. In some instances, the Certificates of Occupancy were in permanent storage and subsequently not available. In this instance, the researcher relied on testimony of reliable sources regarding the actual approval and CO dates. Where testimony was presented in lieu of actual documentation, subsequent interviews with additional administrative personnel was used to verify the data.

Project Completion Time is a measure of project duration. As a complement to this variable of primary concern, the study also explored the relationship of the independent variable, Contract Procurement Method (i.e., PPP or not-PPP) with another

dependent variable Project Speed (Speed). Project Speed is a measure of the development team's efficiency. It is the number of square feet completed per day over the course of the project (as opposed to the course of just the construction period). The formula for computing Project Speed is shown in Equation 5 below.

$$\text{Speed} = \frac{\text{GSF}}{\text{PCT}} \quad (5)$$

Where,

Speed = Project Speed is the number of square feet of building completed per day.

GSF = Gross Square Feet is the total area of the new building.

PCT = Project Completion Time is the number of days between project approval and building occupancy.

Again, the primary difference between Project Speed and Construction Speed (see Equation 2) is that the denominator is the new variable, Project Completion Time, rather than Construction Time, which has been used in the literature. Project Completion Time is a longer period of time that encompasses Construction Time as well as the time taken to complete the contract procurement process (e.g., gaining regulatory approvals as needed, issuing requests for proposal as needed, etc.).



#### 4.4 Research Findings

As an important part of this study, several models were developed to determine the influence of PPPs, the state higher education regulatory structure and whether or not there is a formal housing plan, on the Project Completion Time for a new student housing project. This section details the study findings based on the original research questions. The primary focus of this research has been on the relationship between the choice of using a public-private partnership as a Contract Procurement Method and project duration as measured by the number of elapsed days between project approval and occupancy (i.e., the definition of Project Completion Time). The research seeks to determine whether this relationship is affected by state government regulatory (RegStat) factors and whether or not an institution has a housing plan (Plan). Finally, the study examined the effect of the aforementioned variables (Contract Procurement Method, Regulatory Status and Plan) on project efficiency (Speed).

##### 4.4.1 Testing the Independent Influences of Using a PPP, the State Regulatory Environment and the Campus Asset Management Regime (Housing Plan) on Project Completion Time

The study used simple and multivariate least squares regression analysis to test the five research questions. To ensure that the aforementioned research objectives were met, the reduced models that were ultimately selected as evidence of the hypothesized relationships were tested against the four principal assumptions that justify the use of linear regression analysis for the purposes of prediction. These assumptions are: (1) independence of the errors (no serial correlation), (2) linearity of the relationship between

dependent and independent variables, (3) homoscedasticity (constant variance of the errors versus predictions), and (4) normality of the error distribution (Osborne & Waters, 2002).

The results of a preliminary study of 27 new student housing projects reflected a statistically significant decrease in mean Project Completion Time (PCT) for the PPP projects when they are compared to traditional projects (level of significance = 0.05). With a mean elapsed time of 576 days (1.58 years), PPPs delivered their projects in 54 percent less time than the traditional capital procurement process (mean of 1,254 days or 3.44 years).

Using the same level of significance, the current research examined a sample of 43 projects to address research questions one through three and test the related hypotheses as follows:

Research Question 1: To what extent does the use of a PPP as a contract procurement method affect the completion time for a new, on-campus student housing project?

Hypothesis 1: The use of PPPs in the development of student housing projects will result in a lower Project Completion Time than when a traditional contract procurement method is used.

Research Question 2: To what extent does the state regulatory policy environment affect the completion time for a new, on-campus student housing project?

Hypothesis 2: Project Completion Time will be longer for student housing projects in states where the higher education regulatory agencies have university project-level budgetary approval authority.

Research Question 3: To what extent does the existence of a student housing plan (representative of a more formal asset management environment) affect the completion time for a new, on-campus student housing project?

Hypothesis 3: Project Completion Time will be shorter for student housing projects at universities with a student housing plan.

#### 4.4.1.1 Models for Research Questions 1, 2, and 3

The model used to address Research Question 1 (Contract Procurement Method has a significant impact on Project Completion Time) was as follows:

$$PCT = \beta_0 + \beta_1(CPM) + \varepsilon \quad (1)$$

Where,

PCT = Project Completion Time is the elapsed time between the day a project is approved by the university's governing board to the day when the contractor receives a certificate of occupancy.

$\beta_0$  = The y-axis intercept

$\beta_1$  = The coefficient for the independent variable CPM reflecting the rate of change in PCT when CPM changes from 0 to 1.

CPM = Contract Procurement Method. This is a single-level indicator (dummy) variable that indicates whether or not a PPP is used in a new student housing development (1) or the traditional state procurement process (0).

$\varepsilon$  = Variation in PCT caused by random error

The model used to address Research Question 2 (State Government Regulatory Status has a significant impact on Project Completion Time) was as follows:

$$PCT = \beta_0 + \beta_1 (RegStat) + \varepsilon \quad (2)$$

Where,

PCT = Project Completion Time is the elapsed time between the day a project is approved by the university's governing board to the day when the contractor receives a certificate of occupancy.

$\beta_0$  = The y-axis intercept

$\beta_1$  = The coefficient for the intervening variable RegStat reflecting the rate of change in PCT when RegStat changes from 0 to 1.

RegStat = Regulatory Status. This is a single-level indicator (dummy) variable that indicates whether a given state has a higher education regulatory environment with budget and/or project approval authority (1) or not (0).

$\varepsilon$  = Variation in the results caused by random error

The model used to address Research Question 3 (having a student housing plan has a significant impact on Project Completion Time) was as follows:

$$PCT = \beta_0 + \beta_1(Plan) + \varepsilon \quad (3)$$

Where,

PCT = Project Completion Time

$\beta_0$  = The y-axis intercept

$\beta_1$  = The coefficient for the intervening variable Plan reflecting the rate of change in PCT when Plan changes from 0 (i.e., indicating that there is not a student housing plan in place) to 1 (i.e., indicating that the university has a student housing plan, distinct from its master plan).

Plan = Student Housing Plan. This is a single-level indicator (dummy) variable that indicates whether or not a university has a student housing plan in place (1) or not (0). The existence of a student housing plan reflects a formal asset management environment.

$\varepsilon$  = Variation in the results caused by random error

The researcher used simple linear regression analysis for Models 1 through 3 to determine if the relationships between the dependent variable Project Completion Time (PCT) and the independent variables, Contract Procurement Method (CPM), Regulatory

Status (RegStat) and Student Housing Plan (Plan) were statistically significant (i.e., was the slope coefficient,  $\beta_1$ , different from 0). As indicated in Table 4.5, the only variable that had a significant impact on Project Completion Time was the Contract Procurement Method (CPM), indicating that the use of a PPP makes a difference. The adjusted  $R^2$  for CPM of 13.2 percent suggests that CPM explains only 13.2 percent of the variation in the Project Completion Times observed. This is an indication that there are other factors that influence the change in Project Completion Time.

<b>Model</b>	<b>Variable</b>	<b>Coefficient</b>	<b>Standard Error</b>	<b>p-value</b>	<b>Adjusted R<sup>2</sup></b>	<b>Obs</b>
1	CPM	-492.2282	180.801	0.0095***	0.132445	43
2	RegStat	151.66222	181.3588	0.4079	-0.00721	43
3	Plan	-210.6946	189.7225	0.2732	0.005524	43

\*\*\* Statistically significant at the  $p = 0.01$  level

Table 4.5: The Relationship Between Project Completion Time and the Contract Procurement Method, State Regulatory Environment and Existence of a Student Housing Plan

#### 4.4.2 Testing the Influence of Using a PPP on Project Completion Time in the Presence of Intervening Variables

The simple regression analyses in Models 1 through 3 assume that there is only one independent variable influencing PCT. To account for other factors influencing PCT, additional intervening variables were added into the regression model. These included additional institutional and project specific variables. The objective of creating a model with a combination of independent and intervening variables (i.e., a multivariate regression model) is to determine which of the independent and intervening variables

influence Project Completion Time and to what degree. This model allowed for a statistical analysis of the conceptual framework described in Figure 3.1 on page 92. Using a five percent level of significance, the analysis for Model 4 used the same sample of 43 projects to answer Research Question 4 and test the related hypothesis as follows:

Research Question 4: How do CPM, RegStat and Plan, as well as additional institutional and project specific intervening variables, work in combination to affect Project Completion Time?

Hypothesis 4: Contract Procurement Method has significant influence on Project Completion Time in an interactive way with the variables RegStat and Plan and with other contract-, project-, state- and university-level factors.

The model used to address Research Question 4 (Contract Procurement Method has significant influence on Project Completion Time in the presence of contract-, project-, state government-, and university-level factors) was as follows:

$$\begin{aligned}
 PCT = & \beta_0 + & (4) \\
 & \beta_1(CPM) + \beta_2(Relationship) + \beta_3(Management) + \\
 & \beta_4(Beds) + \beta_5(GSF) + \beta_6\left(\frac{GSF}{Bed}\right) + \\
 & \beta_7(Style) + \beta_8(Materials) + \beta_9(CDM) + \\
 & \beta_{10}(RegStat) + \beta_{11}(AvgPop) + \beta_{12}(\%StudGrwth) + \\
 & \beta_{13}(Plan) + \varepsilon
 \end{aligned}$$

Where,

PCT = Project Completion Time is the elapsed time between the day a project is approved by the university's governing board to the day when the contractor receives a certificate of occupancy.

$\beta_0$  = The y-axis intercept

$\beta_1 \dots \beta_{13}$  = The partial slope coefficients for the independent and intervening variables indicating the rate of change in mean PCT when the variable changes by 1 unit, and all other variables are held constant.

#### Contract-Level Variables

CPM = Contract Procurement Method is a single-level indicator (dummy) variable that indicates whether or not a PPP is used in a new student housing development (1) or the traditional state procurement process (0).

Relationship = Vendor relationship. This is a one-level indicator (dummy) variable. The value is equal to (1) when the university's relationship with the developer is that of a PPP (i.e., the developer retains ownership of the property) and equal to (0) when there is a vendor (arm's-length) relationship with the university retaining ownership of the asset.

Management = Management. This is a one-level indicator (dummy) variable. The value is equal to (1) when the developer or a third party operates the property after the construction process has been completed and equal to (0) when the university (or university auxiliary) is the operator. This transaction is



distinct from the contract procurement process (CPM) used to select a developer to build the project.

#### Project-Level Variables

- Beds = Number of Beds. This is a continuous variable. The value reflects the total number of students housed in the residence hall.
- GSF = Gross Square Feet. This is a continuous variable. The value reflects the total number of square feet included in the completed stand-alone building.
- GSF/Bed = Gross Square Feet per Bed. This is a continuous variable. The value reflects the complexity of the building as it grows larger as more amenities are included in the project.
- Style = Building Style. This is a two-level indicator variable (two dummy variables in formula) that represents the three classes of housing unit configurations observed in the data: suites, apartments and dormitories. The indicator variables are identified as  $Style_1$  and  $Style_2$ . For apartments,  $Style_1$  and  $Style_2$  both equal (0). For suites  $Style_1$  equals (1) and  $Style_2$  equals (0) and for dormitories,  $Style_1$  equals (0) and  $Style_2$  equals (1).
- Materials = Building Materials. This is a two-level indicator variable (two dummy variables in formula) that represents the three general configurations of building materials observed in the data: (1) steel-frame/concrete floors, (2) wood-frame/wood floors and (3) hybrid (i.e., steel-frame/concrete floors on lower levels and wood-frame/wood floors on upper floors). The indicator variables are identified as  $Materials_1$  and  $Materials_2$ . For

structures made with steel-frame and concrete floors,  $\text{Materials}_1$  and  $\text{Materials}_2$  both equal (0). For structures made with wood framing and flooring,  $\text{Materials}_1$  equals (1) and  $\text{Materials}_2$  equals (0). For hybrid structures (i.e., those made with a combination of steel framing and concrete flooring on lower floors and wood framing and floors above),  $\text{Materials}_1$  equals (0) and  $\text{Materials}_2$  equals (1).

CDM = Construction Delivery Method. This is a two-level indicator variable (two dummy variables in the formula) that represents the three general types of building methods observed in the data: Design-Bid-Build (DBB), Design-Build (DB) and Construction Manager at Risk (CMR). The indicator variables are identified as  $\text{CDM}_1$  and  $\text{CDM}_2$ . For projects completed using DBB,  $\text{CDM}_1$  and  $\text{CDM}_2$  both equal (0). For projects completed using DB,  $\text{CDM}_1$  equals (1) and  $\text{CDM}_2$  equals (0). For projects completed using CMR,  $\text{CDM}_1$  equals 0 and  $\text{CDM}_2$  equals (1).

#### State-Level Variables

RegStat = Regulatory Status is a one-level indicator (dummy) variable. It reflects whether or not state higher education regulatory authorities have project approval authority at the university-level (1) if yes, (0) if no.

AvgPop = Average State Population. This is a continuous variable that reflects the average state population over the ten-year period between 2000 and 2010.

%StudGrwth = Percent State Student Population Growth. This is a continuous variable that reflects the average growth in the college-age student population over the eight-year period between 2000 and 2008.

University-Level Variable

Plan = Student Housing Plan. This is a single-level indicator (dummy) variable that indicates whether or not a university has a student housing plan in place (1) or not (0). The existence of a student housing plan reflects a formal asset management environment.

$\epsilon$  = Variation in the results caused by random error

The results from Model 4 are detailed in in Table 4.6.

Variable Name	Coefficient Estimate	Standard Error	t-Value	p-Value	VIF
Intercept	4870.0685	1272.061	3.83	0.0007*	n/a
Contract Procurement Method	-564.14	799.3735	-1.99	0.4866	31.893346
Relationship Management	1018.1279	813.6964	1.25	0.2220	37.584134
Materials <sub>1</sub>	-1165.494	642.1728	-2.33	0.0811	12.628299
Materials <sub>2</sub>	850.0167	631.9026	-0.53	0.1902	8.9252212
Materials <sub>2</sub>	1369.9473	737.5242	-1.35	0.0746	12.947521
Style <sub>1</sub>	1368.8633	421.3387	-0.71	0.0032*	30.997158
Style <sub>2</sub>	-1165.543	520.4745	1.25	0.0339*	34.588509
Construction Delivery Method <sub>1</sub>	-221.999	420.4047	-1.81	0.6019	15.695787
Construction Delivery Method <sub>2</sub>	-755.8371	561.6392	2.18	0.1900	26.080241
Beds	-4.861513	2.443408	1.30	0.0572	50.396399
Gross Square Feet	0.0082213	0.006578	1.35	0.2225	22.349644
Gross Square Feet/Bed	-3.929746	1.689327	1.86	0.0281*	18.943854
Regulatory Status	1488.5609	682.6068	0.15	0.0384*	17.989476
Average Population	3.168091	21.67895	3.25	0.8849	6.7568149
Percent Student Growth	-12623.94	4973.968	-2.24	0.0175*	14.555946
Plan	1299.619	998.9824	-2.54	0.2047	40.676445
* p < 0.05		Adjusted R <sup>2</sup> = 0.45			

Table 4.6: Results of Model 4: Relationship of Project Completion Time to Contract Procurement Method and all of the Intervening Variables

Model 4 still has a relatively low  $R^2$  (45%). There are also contradictory results between Model 1 and Model 4. For example, Model 4 suggests that CPM did not have a significant impact on PCT, whereas Model 1 indicated that CPM had a significant direct impact on PCT. There are several possible reasons for the low  $R^2$  and the contradiction observed. The two most common are missing variable bias and multicollinearity. Missing variable bias occurs when a factor not included in the model has a significant effect on the dependent variable. A missing variable can cause a lower  $R^2$  than would otherwise be observed if the variable had been included. Multicollinearity occurs when there is correlation among the independent and intervening variables. Both reasons (missing variable bias and multicollinearity) can cause the underestimation or overestimation of the impact of the variables in the model. Each of these reasons, and approaches to deal with them, will be explored next.

The possibility that missing interaction terms were causing a missing variable bias for this model was considered. An interaction between the independent variable, Contract Procurement Method, and one or more of the intervening variables was likely because of several observations in the data. For example, the fact that all of the PPP projects in the sample were in states with budgetary approval authority over projects at state college institutions was indicative of some level of interaction between CPM and RegStat. In addition, the fact that PPP projects tended to be larger and more complex than traditionally procured projects was another indication of a potential interaction between intervening variables related to size (e.g., GSF and Beds) and complexity (i.e., GSF/Bed) and the independent variable CPM.

Additional investigation revealed a high degree of multicollinearity among the variables in Model 4. Multicollinearity is a statistical phenomenon that occurs when two or more of the independent and intervening variables in a multivariate regression model are highly correlated. This can cause the reported effect of a parameter to be either overestimated or underestimated and the model's coefficient of determination ( $R^2$ ) to be artificially inflated. Therefore, even the weak adjusted  $R^2$  of 45 percent observed for Model 4 may have been overstated. According to Robert O'Brian (2007), a Variable Inflation Factor (VIF) value of 4.0 or higher often serves as a common threshold to indicate a multicollinearity problem. The problem was detected in the full model because all of the coefficients had VIFs that were above this threshold. The problem may have been caused by the inclusion of more than one variable that measures the same influencing factor.

A common fix for multi-collinearity is to eliminate one or more variables that may be a source of the problem (O'Brian, 2007) and/or to identify other variables (including interactive terms) that might further explain the change in the dependent variable, in this case PCT. In essence, the opportunity presents itself to both fix the missing variable bias and the multi-collinearity problem by changing the variable mix and by bringing new interaction variables into a new model, Model 5.

Two strategies were used to modify Model 4 in order to reduce the multicollinearity issues: (1) the reduction of Model 4 to include only significant variables and (2) the use of stepwise model building techniques to select an uncorrelated subset of the independent and intervening variables. Strategy one proved fruitless. In this reduced

model, all of the variables identified as significant in Model 4 became insignificant, except for  $Style_1$  and the adjusted  $R^2$  fell to nine percent. The results of the second strategy are shown as Model 5 and in Table 4.7. The form of the model is as follows:

$$PCT = \beta_0 + \beta_1(CPM) + \beta_2(RegStat) + \beta_3(Style_1) + \varepsilon \quad (5)$$

In Model 5, CPM reappears as a significant variable, along with RegStat and  $Style_1$ . Model 5 solved the multi-collinearity problem. The results of running the model generated by the stepwise procedure against the data appear in Table 4.7. While the multi-collinearity problem appears to have been addressed, the low adjusted  $R^2$  value (0.36) of the new model suggested that there were still one or more explanatory variables missing.

Variable Name	Coefficient Estimate	Standard Error	t-Value	p-Value	VIF
Intercept	741.69333	127.0665	5.84	<.0001*	n/a
Contract Procurement Method	408.25333	187.6897	2.18	0.0357*	1.1386047
Regulatory Status	-745.6482	193.612	-3.85	0.0004*	1.544186
$Style_1$	626.49333	175.5677	3.57	0.0010*	1.4651163
* p < 0.05		Adjusted $R^2 = 0.36$			

Table 4.7: Results of Model 5: Using a Stepwise Regression Technique to Identify Only Statistically Significant First Order Variables

One limitation of Model 5 is that it assumes that the independent and intervening variables relate to PCT only in a simple linear fashion. This type of model is commonly referred to as a first order model. However, a second-order model (i.e., one that includes

second order terms) might help to explain more of the change in Project Completion Time. Second order terms include squares of the original terms (allowing some terms to have a quadratic relationship with PCT) and products of terms (allowing some terms to have an interactive relationship with PCT, i.e., the interaction mentioned above that could be part of the missing variable bias). The approach taken at this point was to define a second order model that included all the first and second order terms that had been already identified and then to use a variable screening (stepwise regression) technique to reduce the equation to include only the statistically significant terms that are not highly correlated. The results of this approach are contained in Model 6 and Table 4.8.

$$\begin{aligned}
 PCT = & \beta_0 + \beta_1(CPM) + \beta_2(RegStat) + \beta_3\left(\frac{GSF}{Bed}\right) + & (6) \\
 & \beta_4(Style_1) + \beta_5(Style_1)(\%StudGrwth) + \beta_6(Style_1)(SF) + \\
 & \beta_7(Beds)(CDM_1) + \beta_8(Beds)(Beds) + \varepsilon
 \end{aligned}$$

All partial slope coefficients in Model 6 are significant (p-value below the five percent significance level) and the standard errors for all the coefficients are less than the standard errors in previous models. Moreover, the observed value of the adjusted R<sup>2</sup> of 79.5 percent suggests that Model 6 explains almost 80 percent of the variation in Project Completion Time.

Variable Name	Coefficient Estimate	Standard Error	t - Value	p-Value	VIF
Intercept	1665.3507	161.3567	10.32	<.0001*	n/a
Contract Procurement Method	-792.7157	112.4034	-7.05	<.0001*	1.634034
Regulatory Status	345.84637	110.0497	3.14	0.0035*	1.8072913
Gross Square Feet/Bed	-1.780674	0.355031	-5.02	<.0001*	1.4870618
Style <sub>1</sub>	1236.1567	143.1942	8.63	<.0001*	2.0807008
(Style <sub>1</sub> )*(Percent Student Growth)	-15693.81	1923.558	-8.16	<.0001*	3.1879982
(Style <sub>1</sub> )*(Gross Square Feet)	-0.010128	0.002371	-4.27	0.0001*	1.8828507
(Beds)*(Construction Delivery Method <sub>1</sub> )	2.8173983	0.692524	4.07	0.0003*	1.4153183
(Beds)*(Beds)	-0.005998	0.000983	-6.10	<.0001*	1.3463648
* p < 0.05		Adjusted R <sup>2</sup> = 0.795			

Table 4.8: Results of Model 6: Using a Stepwise Regression Technique to Identify Intervening Variables Using Only Statistically Significant First and Second Order Variables

Model 6 successfully reduced the multicollinearity problems and the missing variable problems detected in the previous models. The fact that the VIF values shown in Table 4.8 were reduced below the 4.0 threshold indicates that there is no longer evidence of correlation among the variables used in the model. This enabled the researcher to assume that the estimated partial slopes were relatively unbiased and the adjusted R<sup>2</sup> was not inflated.

The results of Model 6 indicate the following:

1. The fact that the value of the partial slope coefficient for CPM is significant indicates that the choice of using a PPP as a contract procurement method versus using the traditional state process has a statistically significant impact on project completion time for student housing developments at U.S. land-grant universities. The parameter estimate of -792 indicates that by using a PPP, a land-grant



university can decrease the completion time of a student housing project by 792 days (i.e., by more than two years). Perhaps more importantly, the effect of CPM on PCT demonstrated in Model 6 is greater than in Model 1 where CPM is analyzed alone. This confirms the research hypothesis that CPM does impact PCT when state government-level, university-level and project-level intervening variables are included in the analysis. These results answer Research Question 4 (and more importantly, agree with the conceptual framework on page 92).

2. The existence of a state government regulatory regime with budgetary approval authority over university student housing projects also has a statistically significant effect on project completion time at U.S. land-grant universities. Results from Model 6 indicate that having a state government regulatory environment with budgetary approval authority over projects adds 345 days (almost one year) to project completion time. The impact on PCT is larger in this model than the impact effect determined in Model 2 (i.e., 345 versus 152 days) and statistically significant. This variable provides a measure of the political risk inherent in the execution of student housing projects at public universities in the U.S., where projects can be delayed as they compete for state dollars with other types of social infrastructure projects.
3. The complexity of the project, measured by Gross Square Feet per Bed, also has a significant impact on PCT. For each percentage increase in this ratio, the Project Completion Time decreases by 1.8 days. Whereas, it was initially thought that complexity was positively related to longer project duration, this finding provides

a new understanding of the relationship between this variable and Project Completion Time, albeit counter-intuitive. For example, the finding suggests that by adding dining and study areas, a project might take less time to complete. In other words, the time required to complete 5,000 square feet of dining and study area may be less than the time required to complete a similar sized student living area that has multiple units and considerably more detail. This alternative view makes intuitive sense as, on a per-square-foot basis, a project with less detail should have a shorter duration than one with more detail, all other things held equal. Although the results are not what were expected, they actually make sense since it will likely take longer to make more apartments and suites than it will take to build a large cafeteria. Open and communal spaces are actually easier not more complicated to build.

4. Style. Since there are significant interactive terms for Style that are also included in the model, the interpretation of the complete relationship between PCT and Style requires the inclusion of the interaction term. The relationship of style to PCT is represented by the following:

$$1,236 - 15,692 * \%StudGrwth - .01 * GSF$$

This means that changing from a Style<sub>1</sub> value of (0) (apartments) to a Style<sub>1</sub> value of (1) (suites) results in a change of 1,236 days in PCT when percent student growth equals 0 and gross square feet equal 0. As %StudGrwth and GSF increase, the relationship of PCT to style decreases. For example if the state's %StudGrwth were to equal .01 (one percent) and the value of GSF were to equal

10,000, changing from a Style<sub>1</sub> of (0) (apartments) to a Style<sub>1</sub> of (1) (suites) results in an increase in PCT of 979 days.

5. Beds. Since there are significant interactive terms for Beds that are also included in the model, the interpretation of the relationship of PCT and Beds requires the inclusion of the interaction terms. The complete relationship between Beds to PCT is represented by the following:

$$2.8173983 * \text{Beds} * \text{CDM}_1 - 0.005998 * \text{Beds}^2$$

Model 6 suggests that DBB should be used for smaller projects (e.g., less than 500 beds) because DB would cause an increase in PCT in this range. On the other hand, DB should be used for larger projects (e.g., more than 500 beds) as this would cause a decrease in PCT. See Figure 4.1 for a graph of the results of the interaction effects of Beds and CDM on Project Completion Time using sample data.

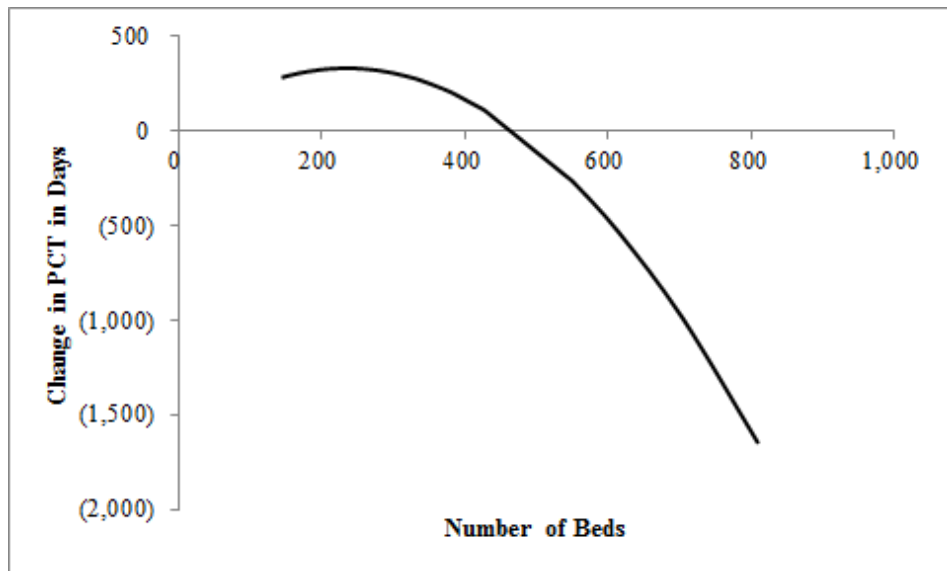


Figure 4.1: Net Effect of Beds on Project Completion Time Using a Design-Build Construction Delivery Method

The aforementioned relationship between Construction Delivery Method, project size and PCT reflected in Model 6 is not found in the literature (DOT, 2005; SAIC et al., 2006; Hale et al., 2009) and appears to be a new finding from this research.

#### 4.4.3 Testing Whether or Not the Benefits of Using a PPP are Related to an Increase in Project Completion Speed

Model 6 was developed to answer Research Question 4 that was focused on the relationship between the Contract Procurement Method and Project Completion Time in the presence of state-, institutional- and project-level intervening variables. A final set of models, Model 7 and 8, was constructed to answer Research Question 5. It tests the relationship between CPM and Project Completion Speed, in the presence of the aforementioned intervening variables. Project Completion Speed is a measure of the development team's (i.e., architect, general contractor, sub-contractors, etc.) efficiency. It is measured by the number of the square feet completed per day over the course of the project. It is calculated as the ratio of Gross Square Feet divided by Project Completion Time.

Using a five percent level of significance, a model was constructed using the same sample of 43 projects used to answer Research Question 5 and test the related hypothesis as follows:

Research Question 5: To what extent is the use of PPPs related to an increase in project efficiency?

Hypothesis 5: Contract Procurement Method has a significant influence on Project Completion Speed (as a proxy for efficiency) in an interactive way with other factors at the levels of state government, university operations and the construction project, respectively.

To test the relationship between Contract Procurement Method and Project Completion Speed as stated in Hypothesis 5, the study used multivariate regression analysis in a manner similar to that used to test the relationship between CPM and PCT. The approach used was to start with a first-order model that included all of the variables identified in Model 4 (Model 7) then to reduce this model using a stepwise variable selection process (Model 8). See Model 7 below for the first-order multiple regression model used to initially test the hypothesis that Contract Procurement Method has significant influence on Project Completion Speed in the presence of contract-, project-, state government-, and university-level factors.

$$\begin{aligned}
 \text{Speed} = \beta_0 + & \hspace{15em} (7) \\
 & \beta_1(\text{CPM}) + \beta_2(\text{Relationship}) + \beta_3(\text{Management}) + \\
 & \beta_4(\text{Beds}) + \beta_5(\text{GSF}) + \beta_6\left(\frac{\text{GSF}}{\text{Bed}}\right) + \\
 & \beta_7(\text{Style}) + \beta_8(\text{Materials}) + \beta_9(\text{CDM}) + \\
 & \beta_{10}(\text{RegStat}) + \beta_{11}(\text{AvgPop}) + \beta_{12}(\% \text{StudGrwth}) + \\
 & \beta_{13}(\text{Plan}) + \varepsilon
 \end{aligned}$$

Where,

Speed = Project Completion Speed is the number of the square feet completed per day over the course of a project. It is calculated as the ratio of total gross square feet divided by Project Completion Time.

The result of running a model using Contract Procurement Method and all of the intervening variables to predict Project Completion Speed is shown in Table 4.9 below.

Variable Name	Coefficient Estimate	Standard Error	t-Value	p-Value	VIF
Intercept	112.42561	136.5367	0.82	0.4178	
Contract Procurement Method	145.45989	85.80078	1.70	0.1020	30.997158
Relationship	-178.7184	87.33813	-2.05	0.0510	34.588509
Management	68.418959	68.92765	0.99	0.3300	15.695787
Materials <sub>1</sub>	81.286057	67.82529	1.20	0.2415	22.349644
Materials <sub>2</sub>	41.278056	79.16218	0.52	0.6065	18.943854
Style <sub>1</sub>	-76.16926	45.22441	-1.68	0.1041	6.7568149
Style <sub>2</sub>	-121.7017	55.86515	-2.18	0.0386*	14.555946
Construction Delivery Method <sub>1</sub>	99.279812	45.12416	2.20	0.0369*	8.9252212
Construction Delivery Method <sub>2</sub>	19.759422	60.28357	0.33	0.7457	12.947521
Beds	-0.388898	0.262263	-1.48	0.1501	31.893346
Gross Square Feet	0.0025469	0.000706	3.61	0.0013*	37.584134
Gross Square Feet/Bed	-0.378541	0.181324	-2.09	0.0468*	12.628299
Regulatory Status	102.14297	73.26763	1.39	0.1751	26.080241
Average Population	4.0844337	2.326911	1.76	0.0910	17.989476
%StudGwth	-666.2707	533.881	-1.25	0.2232	40.676445
Student Housing Plan	219.65585	107.2258	2.05	0.0507	50.396399
* p < 0.05	Adjusted R <sup>2</sup> = 0.89				

Table 4.9: Results of Fitting Model 7 to the Data to Predict Project Completion Speed Using Contract Procurement Method and All Intervening Variables

The high Variable Inflation Factors (i.e., above the threshold of 4.0) that appeared for all the variables listed in Table 4.9 is evidence of a multicollinearity problem in Model 7. As a result, the adjusted R<sup>2</sup> is likely to be overstated and the coefficients may not be accurate for any of the other variables. To correct for this problem, a stepwise

regression technique and second order variables were used to develop Model 8. Then Model 8 was used to test the hypothesis that Contract Procurement Method has significant influence on Project Completion Speed in the presence of contract-, project-, state government-, and university-level factors.

$$\begin{aligned}
 \text{Speed} = & \beta_0 + \beta_1(\text{Plan}) + \beta_2(\text{Beds}) + \beta_3(\text{GSF/Bed}) + \\
 & \beta_4(\text{Materials}_1) + \beta_5(\text{Style}_1) + \beta_6(\text{CDM}_1) + \\
 & \beta_7(\text{GSF/Bed}) * (\text{Style}_1) + \varepsilon
 \end{aligned}
 \tag{8}$$

The results of fitting the dataset to Model 8 appear in Table 4.10. All variable coefficients reflect a p-value below the five percent significance level. Smaller standard errors for all of the listed variables suggest that Model 8 fits the data more tightly than Model 7. Also, the multicollinearity problem has been resolved. The adjusted R<sup>2</sup> of 0.83 suggests that Model 8 explains 83 percent of the change in Project Completion Speed. While the adjusted R<sup>2</sup> is slightly below Model 7, the data problems have been removed.

Variable Name	Coefficient Estimate	Standard Error	t-Value	p-Value	VIF
Intercept	-308.5388	44.22901	-6.98	<.0001*	
Student Housing Plan	130.83992	23.70266	5.52	<.0001*	1.5778025
Beds	0.612581	0.061203	10.01	<.0001*	1.1128147
GSF/Bed	0.4247608	0.101914	4.17	0.0002*	2.5559749
Materials <sub>1</sub>	137.00785	24.16656	5.67	<.0001*	1.8179182
Style <sub>1</sub>	-150.2066	26.41231	-5.69	<.0001*	1.4766118
Construction Delivery Method <sub>1</sub>	179.56295	24.17896	7.43	<.0001*	1.6418496
(GSF/Bed)*(Style <sub>1</sub> )	-0.461298	0.168157	-2.74	0.0095*	3.090905
* p < 0.05		Adjusted R <sup>2</sup> = 0.83			

Table 4.10: Best-Fit Results of Fitting Model 8 to the Data to Predict Project Completion Speed

Note that the variable Gross Square Feet was excluded from Model 8 even though it appeared to be significant in Model 7. The decision to exclude GSF was based on the fact that this variable was already included in the calculation of the dependent variable<sup>25</sup> and the purpose of the study was to determine other drivers of efficiency.

Model 8 suggests the following:

1. The independent variable Contract Procurement Method (CPM) is noticeably absent from the model. The implications are that CPM is not statistically significant and there is insufficient evidence to reject the null hypothesis that Contract Procurement Method has no influence on Project Completion Speed (as a proxy for project efficiency). This answers Research Question 5, suggesting that the reduction in Project Completion Time influenced by CPM found in Model 4 is not related to CPM's ability to enhance project efficiency. In other words, the use of a PPP does not have an influence on how quickly a project is built.
2. The existence of a Student Housing Plan appears to increase project productivity by 130 gross square feet per day versus not having a plan, all other factors held constant. The model provides evidence of the positive impact of having a student housing plan on project efficiency.
3. The number of beds is indicative of project size. The model suggests that as the number of beds increases, so does the development team's efficiency. For each new bed, efficiency increases by 0.61 gross square feet per day, all other factors remaining constant (e.g., for a 200-bed project, productivity increases by 122

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<sup>25</sup> Project Completion Speed=(Gross Square Feet)/(Project Completion Time)



- GSF/day). This is an indication that the economies of scale might have a positive effect on construction efficiency (e.g., the larger the number of beds the more efficiently the development team can complete a project).
4. Similar to item 3 above, as the number of Gross Square Feet per Bed increases, so does a development team's efficiency (e.g., for a 200-bed project, productivity increases by 84 GSF/day). The implication here is that as the project incorporates more amenities (e.g., dining hall, meeting rooms, etc.) workers are able to deliver the building more quickly. This may result from the fact that the types of amenities typically included in student housing have less physical density (e.g., fewer plumbing and electrical fixtures, closets, walls, etc.) and require less intricate workmanship that might otherwise work against contractor efficiency. However, this relationship must be considered in the context of building style because of the interaction between GSF/bed and Style. For example, when suite units are developed, the increase in GSF/Bed will result in a net decrease in efficiency, all other variables remaining constant. Alternatively, when apartment units are developed a one unit increase in GSF/Bed has a net positive effect (increase) on efficiency.
  5. The model suggests that when wood framing and wood flooring are used, a residence hall can be completed more quickly than when steel and concrete are used. All other factors held constant, the choice of wood framing and flooring will increase project productivity by 137 gross square feet per day. This makes sense from the standpoint that steel framing and concrete flooring require a higher level

- of engineering services, support equipment and logistical considerations during the construction process.
6. Model 8 also suggests that when the project is designed for suite-type units, worker efficiency decreases by 150 Gross Square Feet per day compared to when apartment-style units are built. This finding may be due to the fact that the data for apartments include the high-rise (e.g., four or more floors) and garden (e.g., one to three floors) design types, whereas suites are typically all higher-rise structures. The effect of this distinction on Project Completion Speed requires further research.
  7. Using a Design-Build construction delivery method appears to enhance project efficiency by 180 Gross Square Feet per day, all other factors held constant, compared to using Design-Bid-Build. This is in line with the construction management literature (SAIC et al., 2006; Hale et al., 2009) which presents evidence that DB offers time and cost benefits over projects that use Design-Bid-Build as a construction delivery method.

#### 4.5 Conclusion

The study found that the choice of using PPPs had a significant direct influence on decreasing the time required to complete student housing projects at public universities, which addresses Research Question 1 (RQ1) based on the results from using a simple regression model. However, using a similar analytical technique, it was determined that having a state regulatory structure with control over university capital

budgeting decisions or having a formal student housing plan did not have a statistically significant direct impact on the variable Project Completion Time (RQ2 and RQ3) for residence hall projects at public universities.

However, the findings show that when the variables Contract Procurement Method (or CPM, a proxy for PPP status) and Regulatory Status (or RegStat, a proxy for the type of state regulatory environment) were included in the model with other intervening variables, these two key variables of interest did have a significant impact on Project Completion Time (RQ4). Results indicate that the use of a PPP, on average, decreases the time required to complete a residence hall project by 793 days (as measured by the number of days between project approval and completion) at land-grant colleges. In addition, the study found that in states where the higher education regulatory structure has budget approval authority over university projects, the time required to complete the project is increased, on average, by 345 days (Model 6). However, unlike CPM and RegStat, having a student housing plan in place did not appear to have any significant effect on Project Completion Time, even in the presence of other intervening variables.

Results also indicate that the project size, style and construction delivery method all influence the variable Project Completion Time in a model that includes first- and second-order terms (e.g., Model 6). It is interesting to note that when Design-Build is used as a Construction Delivery Method (versus Design-Bid-Build), Project Completion Time is higher for smaller buildings (e.g., 500 beds or less) but the time decreases as the number of beds increases beyond 500, with other factors held constant. This finding supports points made by industry experts who preferred DBB contracts for small, simple

projects and used DB contracts for larger, more complex tasks (G. Vander Mey. Interview granted March 31, 2011). The influence of DB on PCT also supports the literature which indicates that a major benefit of using DB rather than DBB as a construction delivery option is its demonstrated ability to lower project duration (Hale et al., 2009; Rojas & Kell, 2008).

Of the three major variables of interest (CPM, RegStat and Plan), only the existence of a student housing plan had a significant effect on Project Completion Speed (i.e., worker efficiency) (RQ5). However, results from the analysis for Project Speed indicate that the choice of the style of the project and the building materials also influenced project efficiency, as wood-frame construction increased the number of Gross Square Feet completed per day by 137 (versus the use of steel framing and concrete flooring materials), other factors held constant. Paul Williams, Executive Director, Dormitory Authority of the State of New York (Interview granted March 14, 2011) expressed his perception that PPPs used less expensive materials than traditionally procured residence halls. The data does not show this to be the case.

In conclusion, there is substantial evidence from this analysis that there is an incentive for state universities to use PPPs to circumvent state regulatory constraints in order to shorten project completion time and capture certain benefits that might include: (1) cost savings (avoidance of price inflation and interest on project debt incurred), and (2) accelerated cash flows to the university.

## CHAPTER FIVE

### CASE STUDIES

#### 5.1 Introduction

The goal of the case study research described in this chapter is to further the understanding of the relationship, already identified in Chapter Four through quantitative methods, between the use of public-private partnerships and project duration (i.e., the variables Contract Procurement Method and Project Completion Time) in the development of on-campus student housing at state universities. The quantitative analysis in Chapter Four helped to determine with some degree of certainty that there is a significant relationship between the choice of using a PPP and a project's duration. This case study research employed a qualitative methodology based on an embedded, multiple-case study approach to provide evidence to help generalize the findings from the quantitative analysis of land-grant colleges in Chapter 4 to all U.S. public universities.

According to Yin (2009), the most important components of a case study research design are its (1) research questions, (2) propositions, (3) unit(s) of analysis, (4) logic linking the data to the propositions, and (5) criteria for interpreting the findings (p. 27).

The case study research questions expand upon Research Question 4. The results from model 1 answered Research Question 1 and provided evidence that there was a direct relationship between the use of a PPP as a contract procurement method (CPM) and Project Completion Time (PCT). That analysis determined that there was a statistically significant relationship between CPM and PCT whereby the choice to use

PPP shortened project duration. The results from Model 2 quantified the direct relationship between the state higher education regulatory policy and PCT and in this case there was no significant relationship found between the two variables. The results from Model 3 also established that there is no significant direct relationship between the existence of a student housing plan and PCT.

The results from Model 4 provided insights into the nature of the relationship between the state-, institutional-, project- and contract-level variables that influence the relationship between CPM and PCT. These findings provided significant evidence that both the use of a PPP and the type of state government regulatory regime in higher education strongly influenced a project's duration, albeit in different directions with a PPP shortening the duration and state approval requirements lengthening the duration.

The results from model Question 5 indicate that the CPM is not the key driver of efficiency on student housing projects. Rather the analysis revealed that the existence of a student housing plan did have a substantial influence on PCT in the presence of other intervening variables.

The case study research described herein is designed to expand on the analysis to answer Research Question 4 by providing a deeper understanding of the relationship between PPPs and Project Completion Time in the presence of intervening factors. This chapter focuses on the mechanics of the decision-making processes for both types of contract procurement methods. Whereas, the quantitative study in Chapter Four looked at projects developed by institutions with similar characteristics, this research examines projects at two very different campuses in order to identify patterns that might help to

establish the generalizability of the relationships that were identified in Chapter Four. It should be noted that, since neither of the schools have a student housing plan, the influence of this factor (e.g., Research Question 3) was not addressed.

The case study questions to be answered here are as follows:

1. How does the relationship between choosing a PPP as a student housing contract procurement method and Project Completion Time work? (i.e., What are the processes that influence this choice?)
2. How is this relationship influenced by the state regulatory environment?

An additional goal of this case study research was to validate the proposition presented in the conclusion to the quantitative research section, in Chapter Four, that the primary reason why universities choose to use PPPs is to circumvent the regulatory structure in order to meet market demand for student housing. While there may be numerous benefits derived from the use of a PPP in the development of a new residence hall, it appears that the overriding attraction of this contract procurement method was its ability to eliminate uncertainty related to regulatory risk (captured in the term introduced here as “regulatory drag”) from the student housing procurement transaction with respect to cost and timing.

The embedded case study approach allowed for a detailed examination of specific phenomena related to the use of PPPs and traditionally developed residence halls. The use of multiple cases allows for an element of “replication” to be designed into the research. The replication logic used here is analogous to that used to validate scientific findings through multiple experiments. Each case presented was carefully selected

because it (a) predicts similar results (a literal replication) and (b) predicts contrasting results but for expected reasons (e.g., a theoretical replication) (Yin, 2009).

The analysis presented two cases: the University of South Carolina's Upstate Campus in Spartanburg, SC, and the University of Wisconsin's main campus in Madison, WI. These cases were selected because, within the past decade, each school had built at least two new residence halls using the traditional procurement method and a PPP, respectively (i.e., one of each). It is expected that a cross-case comparison of the two PPP projects will reflect a similar internal logic in the choice of this contract procurement method and in its implementation (literal replication). On the other hand, a comparison between the PPP and the traditionally procured project within each case will reflect similar performance outcomes (theoretical replication) at each institution.

Another reason for choosing these two institutions is that they reflect broad differences at the institutional level, yet have similar state regulatory structures. Whereas the quantitative research in Chapter Four held institutional attributes constant by sampling only 1862 land-grant colleges, this study attempted to hold the state regulatory environment constant by selecting two schools in states having agencies with similar levels of budget approval authority over state university capital projects.

The student housing project is the primary unit of analysis for this study. Project outcomes may be affected by the higher educational regulatory environment in the state in which the project is located and the institutional attributes specific to the school sponsoring the project (as noted in the conceptual framework developed in Chapter Three). The goal of the case study is to tease out the impact of these unique intervening



variables (i.e., at the project, institutional and state levels) with respect to the relationship between the choice of Contract Procurement Method and Project Completion Time. It is expected that results will support an emerging theory regarding the interaction between the state regulatory environment and the university regarding the development of student housing projects.

Each individual case is a self-contained study. Each case's conclusions are considered to be the information needing replication by other individual case (i.e., each replicates the other). Findings in the individual case analysis and the results of the multiple-case analysis taken as a whole will indicate how and why the PPP-PCT relationship was demonstrated (or not demonstrated). Finally, the data in the case studies will be linked to the study questions by using techniques such as pattern matching, explanation building and cross-case synthesis. These methods are described in detail in Chapter Three and below.

There are two sets of criteria for interpreting the study's findings to assess their generalizability. The first set considers the strength of competing explanations of the phenomena observed. For example, one of the competing explanations given for the decrease in PCT for projects built by PPPs are that private builders with an ownership interest in a building are more likely to be efficient than those with just a vendor relationship with the government sponsor. The second set of criteria is set forth by Sir Austin Bradford Hill in his 1965 address to the Royal Society of Medicine (Hill, 1965) and used widely in natural and social science research. Often referred to as Hill's Postulates of Causation, they suggest that the ability to move the assessment of an

observation from the category of an “association” to “causation” is related to: (1) the strength of the relationship; (2) the consistency of the relationship across situational differences; (3) the specificity of the association; (4) the temporality of the relationship; (5) the plausibility of the relationship; (6) the coherence; and (7) the existence of analogies to similar phenomena (Hill, 1965). These criteria will be defined in Sub-section 5.4.5.

Section 5.2 will examine the University of South Carolina Upstate case. Section 5.3 will present the case for the University of Wisconsin Madison. Section 5.4 will provide the findings from the application of a rigorous set of analytical tools, and Section 5.5 will provide a summary of the conclusions from the analysis.

## 5.2 The University of South Carolina Upstate

### 5.2.1 Institutional Level Attributes

The University of South Carolina’s Upstate (USC Upstate) campus is located in Spartanburg, SC, a small city in the state’s northwestern corner. USC Upstate was established in 1967 as a two-year regional arm of the University of South Carolina system. It became a four-year institution in 1975. The school offers more than 40 bachelor’s degree programs in the liberal arts and sciences, business administration, nursing, and teacher education, as well as a master’s degree in education. USC Upstate has a diverse community of 5,403 full and part-time students enrolled as of the fall of 2009, with 98 percent coming from across South Carolina’s Upstate region with the

remainder hailing from 36 U.S. states and 51 foreign countries. Today, the 330-acre campus includes residential housing for more than 1,000 students.

The University of South Carolina system is a set of nine campuses. The flagship campus is located in the state capitol, Columbia. The others are in relatively remote, rural locations. Projects at the main Columbia campus have traditionally enjoyed a higher priority, as measured by the amount of time dedicated to matters related at this location at meetings of the Board of Trustees (i.e., as indicated by the number of lines in the meeting minutes dedicated to USC Columbia matters).

The USC Board of Trustees (BOT) is the governing body of the institution. Members of the BOT are appointed by the state General Assembly and the Governor serves as an ex-officio member. The Board of Trustees approves program and construction activities at all of the campuses within the system. Therefore, by the definition used in this research, the board's approval of a new project marks the beginning of the "PCT clock." The USC BOT typically follows a two-step project approval process: (1) BOT's Building and Grounds Committee (which historically has included the USC President) reviews capital project proposals from the various campuses and makes recommendations to the general board as outlined in its meeting minutes; (2) the BOT will vote its approval of a project through its acceptance of the Building and Grounds Committee's meeting minutes.

### 5.2.2 State Level Attributes

There are 33 public colleges and universities in South Carolina. All public colleges and universities must submit an updated Comprehensive Permanent Improvement Plan (CPIP) to the Joint Bond Review Committee (JBRC) and the Budget and Control Board (BCB) annually. The CPIP must include all of the agency's permanent improvement projects anticipated and proposed over the succeeding five years. The CPIP process is designed to provide the BCB and the JBRC with an outline of each agency's permanent improvement activities for the subsequent five years. The CPIP for each higher education agency must be submitted to the Commission on Higher Education for review and recommendation.

The South Carolina Commission on Higher Education (CHE), established in 1967, serves as the coordinating board for the state's 33 public institutions of higher learning and is responsible for serving a dual role within state government, acting both as an advocate for higher education and an oversight entity on behalf of the General Assembly. In addition to its duties to provide direction on educational policy, it approves (recommends) all higher education capital projects, leases, and land purchases and collects and reports building data while assisting the state assembly in determining state priorities.

Members of CHE's board are appointed by the Governor including one at-large member appointed as chair, three other at-large members, six members representing the Congressional Districts, three members representing the public higher learning

institutions, and one member representing the private higher learning institutions. All except the private institution representative are voting members.

The Joint Bond Review Committee (JBRC) is a six member joint committee of the state General Assembly charged, along with other duties, to monitor procedures relating to the approval of permanent improvement projects and the issuance of state general obligation and institutional bonds. Three members are appointed by the chairman of the Senate Finance Committee and three are appointed by the chairman of the Ways and Means Committee of the House of Representatives. Among its many other duties, the JBRC is charged with the review, prior to approval by the Budget and Control Board, any new capital improvement project and to recommend priorities of future bond issuance based on the social and economic needs of the State. The Joint Bond Review Committee, in consultation with the Budget and Control Board, establishes priorities for the funding of all state capital projects and reports its priorities to the General Assembly.

Ultimately, all transactions involving real property must be approved by the State Budget and Control Board (BCB). The Budget and Control Board is comprised of the Governor, who serves as chairman, the State Treasurer, the Comptroller General, the chairman of the Senate Finance Committee, and the chairman of the Ways and Means Committee of the House of Representatives. The essential role of the BCB is to improve efficiency and serve the agencies that serve the citizens of South Carolina. The board has a dual role in that it oversees the functions of 12 operating units that fall under its jurisdiction as well as approves capital and related transactions all other state agencies. The BCB appoints a director who oversees the the 12 organizational units which serve a

“central services” function for the rest of the state’s operating entities. The those units include: (1) general services, (2) information technology, (3) retirement, (4) procurement, (5) budget, (6) human resources, (7) research and statistics, (8) employee insurance, (9) insurance reserve fund, (10) governmental affairs, (11) internal operations, and (12) the Confederate Relic Room and Military Museum.

After the University of South Carolina’s Board of Trustees approves a project there is a two phase process to obtain the approval of state regulators. The first is to secure funding for architectural services. The second phase is to approve funding for construction costs. This process is required, even though, in most cases, the university will be using its own funds (e.g., donor contributions and receipts from revenue bonds secured by student fees).

In Phase I, a project goes through the following three steps to obtain approval for funds for architectural services to design and provide a cost estimate:

- (1) the Commission on Higher Education (CHE) reviews and recommends a student housing project proposal to the Joint Bond Review Committee, typically rubber stamping projects that have trustee approval and that have already appeared on the university’s Comprehensive Permanent Improvement Plan (CPIP);
- (2) the Joint Bond Review Committee reviews the capital project proposal and recommends the project for approval to the Budget and Control Board; and
- (3) the State Budget and Control Board reviews and approves funds for the design component of a student housing project.

A capital project can fail to receive approval at any of these stages as the political agenda changes which can affect any public entity trying to do a project. The deliverables at this stage are a building design and cost estimate.

In Phase II, the project repeats the steps of Phase I for project approval based on its final design and cost estimates. In addition, a project that might be important to a particular campus can lose its priority in the state-wide projects queue in any given year because of another institution's project (whether related to higher education or not) which may have moved to a higher priority in the interim period between phases. Appendix G provides a flow diagram of the State of South Carolina's capital project approval process.

### 5.2.3 Project-Level Attributes – Palmetto House

In the fall of 2002, 50 percent the 1,800 freshman and transfer applicants for admission to USC Upstate<sup>26</sup> had requested on-campus housing. However, the university only had capacity for 200 of the 900 requests for housing. Students who could not be housed on campus were lodged in local motels and in neighboring apartments, without the support associated with on-campus housing. Recognizing the growing need for on-campus student living accommodations, Chancellor Stockwell had been requesting for more than a year that the board approve the university's purchase of a parcel of county-owned land adjacent to the Spartanburg campus to develop new housing to meet student demand. The BOT finally acquiesced when the Chancellor proposed that the housing

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<sup>26</sup> Chancellor of USC Spartanburg, John C. Stockwell, was quoted from the minutes of the USC Board of Trustees' Building and Grounds Committee on February 8, 2002.

transaction be done through a PPP with the newly formed USC Upstate foundation, the Carolina Piedmont Foundation (CPF).

The Palmetto House project was approved by the board and was set up to be a university foundation development on the land newly acquired by the Carolina Piedmont Foundation from Spartanburg County. The new residence hall would be funded by a \$15 million JEDA (Jobs Economic Development Authority) bond which would appear as debt on the books of the foundation. Under the contract between the university and the foundation, the CPF would directly develop and own the facility. The CPF was the private-partner in this public-private partnership.

USC Upstate would manage and provide all support services for an agreed-upon fee to the foundation. Students living in the new housing would receive the same level of service as those in existing housing. In addition, the foundation would have its own financial accounting function, operated separately from the university, and rental rates would be consistent with the existing housing market.

The new building, called the Palmetto House, was the first phase of a two-phase residence hall construction effort. The residence hall was completed using a design-build construction delivery method. It was built adjacent to the University Commons, a site selected because of its proximity to athletic, academic, and recreational facilities. See Figure 5.1 for a photograph of Palmetto House and Magnolia House.





Figure 5.1: Palmetto House (bottom) and Magnolia House at University of South Carolina Upstate Campus in Spartanburg, SC (Photo provided with permission of Robert Connelly, Vice Chancellor, USC Upstate).

Palmetto House has eighty-seven suites, including single or double rooms and handicap-accessible units. This 105,000 square foot traditional-style complex can house up to 346 students. Each floor has a living/learning common room with a full kitchen. On the ground level facing University Commons, a commons arena includes features such as a community center, study spaces, a 20-station computer lab with printer, and laundry rooms.

#### 5.2.4 Project-Level Attributes – Magnolia House

Whereas it took 18 months to complete the Palmetto House, it took three years to complete the Magnolia House project. Construction for the Magnolia House was approved in the fall of 2006. Construction was not completed until August 2009.

Magnolia house is a 96,500 GSF complex which can house up to 352 students in its eighty-seven suites, which include single and double rooms with a bathroom per suite. The building has eight study rooms for in-house tutoring and most of the amenities of Palmetto House including laundry rooms. The two residence halls are similar except for the contract procurement and construction delivery methods used. In addition to being able to examine the impact of choosing a PPP for one residence hall and using the traditional state procurement method on the other, the effect of using a Design-Bid-Build versus a Design-Build construction delivery method can also be observed.

The development of Magnolia House (project Phase II) relied on the traditional state capital procurement process. The traditional process has advantages and disadvantages. One of the advantages of the traditional procurement process is in the reduced cost of obtaining project financing. The issue costs for state revenue bonds for a traditional university capital project are cheaper than those for a PPP, because the cost of the state treasurer's finance and legal teams are not allocated to the project. These and other transaction costs, such as the swap<sup>27</sup> attorney, swap advisor and the bank attorney fees, can exceed several hundreds of thousands of dollars are not allocated to the specific project on state financed construction.

Finally, since all the development functions for real estate on the university's campus take place under one office (Facilities Management), Magnolia House benefited from some economies of scale, whereas the Carolina Piedmont Foundation had to build a

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<sup>27</sup> Interest rate swap agreements are used by universities to convert adjustable bond interest rates into equal monthly payments. This helps in the budgeting process and the planning of cash flow requirements. Not sure this is really necessary. How does it impact what you are trying to study? I would delete.

redundant process for the Palmetto House project. Moreover, the project design was substantially complete and the materials had already been chosen when the traditionally-financed Magnolia House was contemplated. In addition, the university hired the same architect that the foundation had used on Phase I which made the process easier than if a new team had been selected and the development process started from scratch.

There were a few disadvantages of the traditional process. Even though the school ultimately used the same contractor for both buildings, the state used a Design-Bid-Build construction delivery method for Magnolia House (the traditional procurement process), making the contractor submit a competitive (rather than negotiated) bid for the construction work. As a result, the contractor earned less profit<sup>28</sup> and increased the risk of litigation<sup>29</sup>. The primary disadvantage was that the traditional project took longer to complete (i.e., three years versus 18 months).

### 5.3 The University of Wisconsin Madison

#### 5.3.1 Institutional Level Attributes

Founded when Wisconsin achieved its statehood in 1848, the University of Wisconsin Madison (UW Madison) is the flagship campus of the University of Wisconsin System. The University of Wisconsin became a land-grant institution in 1866. The 933-acre UW Madison campus is organized into 20 departments which enrolled 42,180 students and granted 10,233 degrees in the 2010-2011 academic year (University of Wisconsin System, 2011, p. 13).

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<sup>28</sup> According to comments made by Vice Chancellor Bob Connelly in an interview granted March 24, 2011.

<sup>29</sup> Observation made by the State Engineer, John White in an interview granted March 28, 2011.

The University of Wisconsin System consists of 13 four-year institutions, 13 two-year colleges, an extension program and the administrative offices for the system. The Board of Regents of the University of Wisconsin System consists of 18 members, 16 of whom are appointed by the Governor subject to confirmation by the Senate. The board establishes policies and rules for governing the system, creates plans to meet future state needs for collegiate education, sets admission standards, reviews and approves university budgets and establishes the framework within which each institution is allowed to operate.

The state of Wisconsin has a multi-phase capital project approval process for its public universities similar to South Carolina. Each university has a campus development plan that defines overall land use patterns, identifies potential construction needs, and ensures cohesive, aesthetic development compatible with the community and environment. Each university also has established a Campus Planning Committee that provides fiscal oversight for the various affected entities within the institution. Additionally, separate committees are established for individual major projects. Each university prepares an annual capital budget which is part of a Six-Year Facilities Plan. The University of Wisconsin System Office of Capital Planning and Budget is responsible for formulating a system-wide, six-year plan and submits a biennial capital budget request for consideration by the Board of Regents.

Badly deteriorated facilities at many of the campus' residence halls and the statutory requirement to add a new sprinkler system at Ogg Hall by January 2008 provided the Madison campus with an incentive to undertake a campus make-over as

documented in its residence hall and food service master plan.<sup>30</sup> The strategy behind the construction plan was to respond to the demand for on-campus housing from first year students and their families and to keep room rates at or below the midpoint of the “Big Ten” Conference<sup>31</sup> schools and the local market rate for comparable facilities. The university administration felt that this would help to recruit the best students and ensure that the largest number of students would be able to take full advantage of on-campus programs and services.

The Division of University Housing continues to be a 100 percent, self-supporting, revenue-generating auxiliary enterprise. Under the residence hall and food service master plan, the majority of the cost related to new residence hall construction and major renovation projects was to be financed with 30 year (new building projects) and 20 year (renovation projects) program revenue bonds. The remaining cost was to be funded with cash generated from program revenue.

### 5.3.2 State Level Attributes

Once approved by the Board of Regents, budget requests are submitted to the Department of Administration’s Division of State Facilities (DSF). The division then prepares a capital budget request for all state agencies.

The Wisconsin State Building Commission is an eight-member body consisting of the Governor, three senators and three representatives, and one citizen member who is

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<sup>30</sup> This is not the same as a student housing plan used as a variable in the quantitative section of this research. Wisconsin’s plan is more of a facility maintenance and new construction plan. See the operating definition of a student housing plan in Appendix A.

<sup>31</sup> The Big Ten Conference consists of 12 public institutions located in the Mid-west, ten of which are land-grant universities.

appointed by the Governor. The commission is subdivided into two subcommittees: a Higher Education Subcommittee and an Administrative Affairs Subcommittee. The Higher Education Subcommittee is responsible for reviewing building program requests from the University of Wisconsin System. Every two years, as part of the biennial budget process, the commission recommends to the legislature a state building program, which includes a list of projects and funding sources to meet the state's capital improvement and maintenance needs over the following two-year budget cycle. Both houses of the legislature include the capital budget as part of their deliberations during the biennial budget process.

### 5.3.3 Project Level Attributes – Newell Smith Hall

Newell J. Smith Hall was completed July 1, 2006. Its construction was considered as the first step in the university's East Campus Development Plan. This project included the construction of a 162,000 square foot residence hall, a 139,000 square foot office building and a 335-stall parking ramp complex, located on private land adjacent to the Madison campus. The residence hall includes six stories and a partial basement that houses approximately 425 first-year students. The standard living unit has a common bathroom shared by two to three rooms (four to five residents). The building includes a residence life apartment, staff offices, and other management and operational support space. Other features are common areas on each floor (study room, social program space for floor residents and a small kitchen); a technology center; classroom space; offices for tutoring, advising, and faculty; general program space for out of classroom learning

activities and other student initiated programs; laundry facilities; study space and a small food service market/coffee house operated by the Division of University Housing. Residents of the new hall receive their main food service at Gordon Commons, located on Johnson Street, as well as other campus dining venues.

The initial plan was for UW Madison to lease the residence hall, office and parking facilities from the developer, Boldt Development Company, for \$6,250,000 annually. The lease was for thirty years with an option to purchase. The university decided to exercise its option to purchase the complex at the completion of construction. Under the original agreement, the UW Madison was to be responsible for all building operation, staffing, maintenance costs, real estate taxes and insurance. Rental payments were to be provided from a combination of program revenue and institutional funds available to UW Madison.

The university's East Campus Development Plan included the creation of a technologically advanced, arts and humanities district, the consolidation of student services along a new pedestrian corridor, and the construction of contemporary university residence halls to improve the undergraduate student living experience. This PPP arrangement provided the opportunity to expedite the replacement of "Old" Ogg Hall and avoid costly investments in that structure which would be lost when the building was ultimately demolished within a few years. The close location of Smith and the "New" Ogg residence halls provides a food service cluster for efficient staffing and service to the residents of the two facilities and avoids the expense of an additional food service center. See Figure 5.2 which shows a photograph of Newell Smith Hall.



Figure 5.2: Photograph of Newell Smith Hall. Permission to use granted by the University of Wisconsin Madison.

#### 5.3.4 Project Level Attributes – Ogg Hall

The university's Division of University Housing makes scheduled facility improvements such as replacing outdated building systems and changes required by new regulatory codes. However, under its new master plan, the university has committed to make a major investment in the building of new residence halls and to the complete remodeling of selected structures to provide quality on-campus housing for students. The average age of housing at UW Madison is fifty years.

The new Ogg Hall provides housing for 600 first-year and second-year students and 15 house fellows. The co-ed residential facility opened in 2007 and remains the



newest of 17 residences operated by the Division of University Housing. The bathrooms are organized around four double room clusters. The only single rooms in the residence hall are for the house fellows. Five of these clusters constitute a forty bed “house” which is managed by a house fellow. The new residence hall replaced the beds in the two towers of “Old” Ogg Hall. That building was demolished after Newell Smith Hall was complete. Terraced sand volleyball and basketball courts were constructed on the former Ogg Hall site. See Figure 5.3 which shows a photograph of the new Ogg Hall.



Figure 5.3: Photo of the New Ogg Hall at University of Wisconsin Madison. Permission to use granted by the University of Wisconsin Madison.

## 5.4 Case Analysis

### 5.4.1 Pattern Matching

One effective analytical technique in case analysis is the use of a pattern-matching logic. This logic compares an empirically based pattern with a predicted one. If the patterns coincide, the results can help a case study to strengthen its internal validity (Trochim, 1989). The predicted pattern is that the PPP projects will have a shorter Project Completion Time than the traditionally sourced projects. Using data collected according to the outline designed for the case studies, the findings were compared based on the five major topic areas in order to identify patterns in the data. Tables 5.1 and 5.2 are summaries of the findings for the University of South Carolina Upstate and the University of Wisconsin Madison cases, respectively.

Regulatory Interface	<ul style="list-style-type: none"> <li>• Coordinating Agency – Commission of Higher Education</li> <li>• Program Approval Authority</li> <li>• Budgetary Approval Authority</li> <li>• Aggregated Budget</li> </ul>
School Attributes	<ul style="list-style-type: none"> <li>• 4- Year, Non-Residential</li> <li>• 2010 Student Enrollment – 5,403; 0.9% Grad Students</li> <li>• Top 25th percentile score - Math: 430; Reading 420</li> <li>• Located in small town – 37, 334</li> <li>• No research activity</li> <li>• Endowment - \$3.4 million</li> <li>• Campus size: 300 acres</li> </ul>
PPP Project	<ul style="list-style-type: none"> <li>• Name: The Palmetto House</li> <li>• Project Owner: USC Upstate Foundation</li> <li>• Style: Suite-Style; single and double occupancy rooms</li> <li>• Size: 105,000 square feet; 350 beds</li> <li>• Project Approved: June 27, 2002</li> <li>• Project Completed: December 15, 2003</li> <li>• Cost: \$12.5 million</li> <li>• Amenities: computer labs, open areas, laundry facilities, postal center and housing management offices</li> <li>• Purchased from Foundation in 2007 for \$13,050,000</li> <li>• PCT: 536 days (1.47 years)</li> </ul>
Rationale for PPP Project	<ul style="list-style-type: none"> <li>• Build new facilities quickly to meet demand for on-campus student housing</li> <li>• Put debt on books of USC Upstate Foundation not the institution</li> <li>• Ensured deadlines are met</li> </ul>
Traditional Project	<ul style="list-style-type: none"> <li>• Name: Magnolia House</li> <li>• Style: Suite-style; single and double rooms; handicap-accessible units</li> <li>• Size: 96,500 square feet; 352 beds</li> <li>• Project Approved: April 20, 2007</li> <li>• Project Completed: September 1, 2009</li> <li>• Cost: \$15 million</li> <li>• Amenities: eight study rooms for in-house tutoring, free laundry facilities</li> <li>• PCT: 865 days (2.37 years)</li> </ul>

Table 5.1: Case Summary for the University of South Carolina Upstate

Regulatory Interface	<ul style="list-style-type: none"> <li>• Consolidated Governance: Board of Regents Governs 4-year institutions</li> <li>• Program Approval Authority</li> <li>• Budget Approval Authority</li> <li>• Individual Budget</li> </ul>
School Attributes	<ul style="list-style-type: none"> <li>• 4-Year, Residential</li> <li>• 2010 Student Enrollment – 41,654; 27.3% Grad Students</li> <li>• Top 25th percentile score – Math: 620; Reading: 550</li> <li>• Located in Mid-size City – 236,901</li> <li>• High research activity</li> <li>• Endowment: \$1.8 billion</li> <li>• Campus Size: 935 Acres</li> </ul>
PPP Project	<ul style="list-style-type: none"> <li>• Name: Smith Hall</li> <li>• Style: Dormitory-style; single and double occupancy rooms; hallway bathrooms</li> <li>• Size: 158,733 square feet; 425 beds</li> <li>• Project Approved: June, 2004</li> <li>• Project Completed: January 1, 2006</li> <li>• Cost: \$37.5 million</li> <li>• Amenities: computer labs, open areas, laundry facilities, postal center, housing management offices</li> <li>• PCT: 579 days (1.59 years)</li> </ul>
Rationale for PPP	<ul style="list-style-type: none"> <li>• Key step in the East Campus Development Plan; expedited replacement of “Old” Ogg Hall and avoided costly investments in a structure that was scheduled for demolition.</li> <li>• Developer built residence hall, office building and parking facility on privately-owned property adjacent to campus; saved time and money related to land acquisition; UW Madison negotiated building lease from the developer but decided to exercise purchase option</li> <li>• PPP ensured deadlines were met</li> </ul>
Traditional Project	<ul style="list-style-type: none"> <li>• Name: New Ogg Hall</li> <li>• Style: Dormitory-style; single and double occupancy rooms; hallway bathrooms</li> <li>• Size: 188,816 square feet; 615 beds</li> <li>• Project Approved: February 5, 2004</li> <li>• Project Completed: August 1, 2007</li> <li>• Cost: \$27.9 million</li> <li>• Amenities: technology center, classroom, and tutoring rooms; general program space; laundry, a study space, hall offices; and a small food service venue</li> <li>• PCT: 1,273 days (3.49 years)</li> </ul>

Table 5.2: Case Summary for the University of Wisconsin Madison

Table 5.3 is a summary of the patterns observed between the two case studies at the project level of analysis. Even though there are substantial differences between the project attributes and cultures of the two schools, the project outcomes are similar, providing evidence that the findings in the quantitative analysis apply outside of the context of the 1862 land-grant schools.

<b>University of South Carolina Spartanburg</b>					
<u>Variable</u>	<u>Units</u>	<u>Traditional</u>	<u>PPP</u>	<u>Diff</u>	<u>% Diff</u>
PCT	Days	865	536	(329)	-38.0%
GSF	GSF	96,500	105,000	8,500	8.8%
Beds	Beds	352	350	(2)	-0.6%
GSF/Bed	GSF	274	300	26	9.4%
Speed	GSF/Day	112	196	84	75.7%
Cost/GSF	Dollars	\$ 155.44	\$ 119.05	\$(36.39)	-23.4%

<b>University of Wisconsin Madison</b>					
<u>Variable</u>	<u>Units</u>	<u>Traditional</u>	<u>PPP</u>	<u>Diff</u>	<u>% Diff</u>
PCT	Days	1,273	579	(694)	-54.5%
GSF	GSF	188,816	158,733	(30,083)	-15.9%
Beds	Beds	615	425	(190)	-30.9%
GSF/Bed	GSF	307	373	66	21.7%
Speed	GSF/Day	148	196	48	32.1%
Cost/GSF	Dollars	\$ 147.76	\$ 198.61	\$ 50.84	34.4%

Table 5.3: Summary of Patterns Observed Between Two Case Studies at the Project Level

The analysis shows meaningful differences at the project level between the traditional and the PPP projects within each of the case studies. These results are similar to the findings in the quantitative analysis in Chapter Four. For example, when comparing the PPP and the traditional projects, the PPP had the shorter Project Completion Time (PCT) at both USC Upstate and UW Madison. Also, Project Completion Speed (the number of gross square feet completed per day represented by the variable Speed) was greater for the PPP projects than for the traditional ones, indicating greater efficiencies were captured under the PPP scenario. Finally, the PPP projects tended to be more complex than the traditional ones as indicated by the variable Gross Square Feet per Bed (GSF/Bed).

In each case, managers directly involved suggested that the PPP was used in order to ensure that specific deadlines were met and that mission agendas were followed (M. Kinderman, Director of Capital Planning, UW Madison. Interview granted on May 17, 2012; R. Connelly, Vice Chancellor, USC Upstate. Interview granted on March 24, 2011). In each of the cases presented, the state regulatory structure possessed budget approval authority and the choice of using a PPP resulted in a shorter Project Completion Time. This is another pattern that reinforces the significance of the intervening variable, Regulatory Status, found in the quantitative analysis in Chapter Four.

In each case, there were three levels of regulatory oversight involved with the approval of capital projects after the institution’s governing body had already vetted the program. Table 5.4 gives a comparison between the States of South Carolina and Wisconsin with regard to the capital approval process.

Function	South Carolina	Wisconsin
Institutional Governance	Board of Trustees	Board of Regents
Budget Coordinating	Commission on Higher Education	
Budget Consolidating		Division of State Facilities
Administrative Oversight	Budget and Control Board	State Building Commission - Higher Education Subcommittee
Legislative Oversight	Joint Bond Review Committee	Joint Committee on Finance

Table 5.4: Comparison of State Capital Project Approval Processes between South Carolina and Wisconsin

In each case, there are “extra-institutional” regulatory bodies with budgetary approval authority over the institutional capital procurement process. However, each institution also has similar “intra-institutional” governing bodies. Both USC’s Board of Trustees and UW’s Board of Regents are responsible for the oversight of multiple institutions. The University of South Carolina and the University of Wisconsin “educational systems” are both characterized by an anchor institution which tends to get the bulk of the governing board’s attention as a result of the size, complexity and the politically sensitive nature of that campus. In the South Carolina case, the University of South Carolina at the Columbia location is the anchor campus and experiences more activity on the Board of Trustees meeting agenda than any of the other campuses. USC Columbia’s enrollment is, on average, almost an order of magnitude larger than the average of other institutions within the system. As one would expect, it is difficult for USC Upstate’s needs to get equal attention from the USC Board of Trustees. On the other hand, UW Madison is the anchor campus of the University of Wisconsin System. It does receive more attention from the Board of Regents. However, in both cases, their capital needs must compete with the needs of their sister schools to make it to the next stage as the Board of Regent has budget approval authority over all capital projects.

In South Carolina, the Commission on Higher Education (CHE) reviews proposals and respective recommendations on behalf of all public institutions of higher education for renovation, repair and maintenance, new construction projects and leases at its monthly meetings. The Commission’s approvals are subject to adoption or can be overturned by the Joint Bond Review Committee (JBRC) and the Budget and Control

Board (BCB). CHE's role is that of a coordinating body that collects information and makes recommendations in light of the institutions' Comprehensive Permanent Improvement Plans (CPIP) which it also reviews and approves.

Wisconsin state government does not have an organization that serves this coordinating function for higher education. Instead, it has an organization that serves a consolidating role for capital budget requests received from all of the state agencies, called the Division of State Facilities (DSF), which is a unit of the Department of Administration. Once approved by the Board of Regents, a campus' budget request is submitted to the DSF. The division prepares a capital budget request for all state agencies for review by the State Building Commission.

There is a similar pattern of state regulatory authority between the two states at the administrative and legislative oversight levels. The Governor of South Carolina serves on South Carolina's State Budget and Control Board and Wisconsin's Governor serves on Wisconsin's State Building Commission. The two organizations are similar in structure and function in regard to their budget approval authority for capital project proposals from state agencies. Both state organizations include the leadership team from both houses of their respective state legislatures. Ostensibly, the role of each of the two state organizations is to improve efficiency in state government. In both cases, public university projects can be supported or denied funding at this level.

The statutory role of South Carolina's Joint Bond Review Committee is "to study and monitor policies and procedures relating to the approval of permanent improvement projects and to the issuance of State general obligation and institutional bonds" among



other responsibilities (2010 South Carolina Code, Title 2, Chapter 47). In a similar fashion, Wisconsin's Joint Committee on Finance serves as that state's legislature's "fiscal watchdog" in its on-going review of state agencies' spending plans. Again, public university projects can be supported or denied funding at this level. Thus, there is another pattern match between the two cases with respect to legislative oversight.

The two universities exhibit vast differences with respect to the diversity of revenue sources, the campus culture and the overall character of their respective student bodies. USC Upstate was predominately a commuter campus with a small student body (with mediocre test scores) and a negligible graduate program, while UW Madison was primarily a residential campus with a large, diversified student enrollment (larger than USC Upstate by a factor of seven with a more competitive academic environment) which included a broad set of graduate programs. USC Upstate's portfolio of real estate assets was meager when compared to UW Madison's. For example, UW Madison had three times as many acres of land. USC Upstate relies on student tuition as its primary funding source, while UW Madison's operations were supported by a healthy endowment and a large number of research grants in addition to its income from student tuition. The fact that such different schools exhibit similar relationships between the variables of interest (e.g., CPM, PCT, and RegStat) with regard to student housing projects reinforces the claim of generalizability of the findings in Chapter Four to all state universities.

#### 5.4.2 Explanation Building from the Two Case Studies

The goal of explanation building is to identify the causal links that define a transaction in order to provide critical insights into public policy processes which support or disprove social science theory (Yin, 2009). The key causal links in residence hall transactions at state universities that use PPPs are (1) the identification of an immediate demand for on-campus student housing, (2) the assessment of high political risk regarding the university's ability to complete a project in a timely manner through the traditional capital procurement process; and (3) the expectation that using a PPP provides a more expedient process, with quality and cost held constant.

The acquisition of real estate to build a residence hall at a public university appears to introduce a procedural "wild card" in the capital procurement process. The politics surrounding the procurement process when land was involved appeared to make the traditional contract procurement method a less attractive option for both USC Upstate and UW Madison. The perception by administrators at both institutions was that approvals would take longer at both the Board of Trustee (or Board of Regents) and the state levels.

However, USC Upstate took a different path from UW Madison in choosing to use a PPP to meet its student housing needs. A review of the USC board minutes revealed that the governing board was reluctant to support the Spartanburg campus' strategic shift from a commuter to a residence focused campus. This is demonstrated by the board's repeated denial of public dollars to support a new residence facility, even after it was presented with evidence of strong student demand. This perceived reluctance by the

board prompted USC Upstate to use its affiliated foundation as the third party developer for its first of two proposed residence hall projects. Using the not-for-profit University of South Carolina Upstate Foundation (formerly the Carolina Piedmont Foundation), appears to have been the school's only option to build its residence hall. The foundation acquired the land from the County of Spartanburg, hired the architect and contractor, and signed a lease-back agreement with the university. Vice Chancellor for Business Affairs, USC Upstate, Robert Connelly, served as vice president of the foundation. In that role he provided the financial analysis and procurement functions that the state treasurer's office or state procurement office would have normally provided under a traditional procurement. Similar to the UW Madison case, the deal was structured as part of a land acquisition transaction that would keep the financing off of the university's books.

Given the assumption that the University of Wisconsin Madison could have easily purchased the adjoining property and developed a new residence hall on its own, there must have been some tangible benefit gained from having a third party undertake the Smith Hall project on the university's behalf. The most plausible explanation for choosing this path is that UW Madison administrators concluded that a PPP arrangement was needed for the Smith Hall project in order to avoid the expected time delay inherent in the state project approval process.

In addition, there is some evidence that the UW Madison may have chosen the PPP path as a deliberate strategic move to save on land acquisition costs. Information provided in an interview with an administrator at another state university (R. Broyden, Associate Chancellor, Capital Projects, Virginia Polytechnic and State University.

Interview granted May 10, 2012) suggests that a major motivation for using PPPs is to avoid statutory requirements to publicize the school's interest in land acquisition. His perception was that public awareness of a major institution's intentions to buy land tends to drive up the market values of surrounding property. The avoidance of this scenario appears to have been a motivating factor in the University of Wisconsin's choice to work with the Boldt Development Company in a partnership to develop Newell Smith Hall. Secondly, there is evidence that it was in the university's best interest to use a PPP in order to expedite the Smith Hall project so as not to jeopardize other projects that were part of their larger master plan (Minutes from State Building Commission Meeting, June 2004; Kinderman, Director of Capital Planning, UW Madison. Interview granted on May 17, 2012).

A major concern for the UW Madison administration in choosing a PPP was to complete Smith Hall quickly so that residents of the old Ogg Hall could move in before the new Ogg Hall was completed. Similar to USC Upstate, the demand for student housing was a driving factor and both schools needed to use a PPP in order to meet that demand more quickly. In each case, the school used the traditional procurement method for future student housing projects after the university had responded to the more immediate need.

#### 5.4.3 Cross-case synthesis

Cross-case synthesis involves the aggregation of findings across a series of individual studies. The analysis is likely to be more robust than having only a single

case. “This method is directly analogous to cross-experiment interpretation” (Yin, 2009, p. 160). Table 5.5 provides the results of a cross-case synthesis of selected factors in the two case studies.

Panel A						
			A	B	C = B-A	D = C/A
			USC	UW		
Variable	Units		Upstate	Madison	Diff	% Diff
PPP	PCT	Days	536	579	43	8.0%
	GSF	GSF	105,000	158,733	53,733	51.2%
	Beds	Beds	350	425	75	21.4%
	GSF/Bed	GSF	300	373	73	24.5%
	Speed	GSF/Day	196	274	78	39.9%
Traditional	PCT	Days	865	1,273	408	47.2%
	GSF	GSF	96,500	188,816	92,316	95.7%
	Beds	Beds	352	615	263	74.7%
	GSF/Bed	GSF	274	307	33	12.0%
	Speed	GSF/Day	112	148	37	33.0%

Panel B				
Variable	USC-UW Combined		PPP vs Traditional	
	A	B	C = B-A	D = C/A
	PPP	Traditional	Diff	% Diff
PCT	1,115	2,138	1,023	92%
GSF	263,733	285,316	21,583	8%
Beds	775	967	192	25%
GSF/Bed	673	581	(92)	-14%
Speed	470	260	(210)	-45%

Table 5.5: Results of Cross-Case Synthesis for USC Upstate and UW Madison

The findings of the cross-case synthesis show that projects using PPPs exhibit shorter Project Completion Times than traditionally-procured projects. This is true within each case and when the case results are combined. Panel A in Table 5.5 shows that at each university, PPPs took less time to complete than traditionally sourced projects in each case. Panel A also illustrates how well PPPs were able to manage their schedules

compared to developers of traditionally-sourced projects. The number of days to complete the PPP project at each of the two schools differs by only eight percent. On the other hand, the duration of traditionally-sourced projects shows a 47 percent difference between the two schools. This may be an indication of how difficult it might be to control PCT in the presence of Regulatory Drag, or political risk imposed by the respective regulatory systems. Also, despite a 51 percent difference in size as measured in Gross Square Feet, the PCT for the two PPP projects are reasonably close (i.e., eight percent difference). This reinforces the quantitative findings that there is no significant relationship between GSF and PCT. Finally, the analysis reinforces the positive relationship between GSF/Bed and project efficiency (Speed) demonstrated in the quantitative analysis.

Panel B shows that the combined differences (across cases) between PPPs and traditionally-sourced projects exhibit a similar pattern as found within each case. For example, in Panel B the combined results show that traditionally-sourced projects take almost twice as long to complete than PPPs (i.e., 92 percent more days).

#### 5.4.4 Examination of the Strength of Competing Explanations

The observation that Project Completion Time was lower when a PPP was used rather than the traditional contract procurement method might be explained by other phenomena. Some of the more obvious factors are ruled out by the circumstances. For example, one explanation might be that PPPs use cheaper materials and shoddy construction that allow them to complete projects more quickly. In the case of USC

Upstate, the same materials were used for the PPP and for the traditionally-sourced projects. In addition, the same contractor completed both projects using the same design, architect and subcontractors.

Another argument might be that different unit styles lend themselves to different levels of efficiency. In the case of UW Madison, the fact that both Smith and Ogg Halls were built on the same design (i.e., dormitory style with group bathrooms) defuses this explanation as an alternative theory. Similarly, at USC Upstate, both Palmetto House and Magnolia House used the same suite design.

Another theory that might be considered is that PPPs typically employ Design-Build (DB) as a construction delivery method, which the construction science literature supports as reducing construction completion time, when compared to Design-Bid-Build (DBB), the delivery method usually used by state procurement offices. Again, the fact that the same contractor, architect and subcontractors were used by USC Upstate for both its PPP and Traditional projects refutes this theory. Even though a DBB protocol was officially used for Magnolia Hall, the fact that the same team was able to work on both buildings created a de facto DB environment for that project as well.

As a result of the weaknesses found in alternative explanations for the decrease in Project Completion Time observed when PPPs are used to build residence halls at public universities, this study concludes that the difference is attributed to the ability of the university to avoid the adverse effects of over-regulation (Regulatory Drag) under this contract procurement mechanism.

#### 5.4.5 An Application of Hill's Postulates to Social Science

The study uses seven of the nine postulates put forward by Sir Austin Bradford Hill (1965) to strengthen the generalizability of the quantitative findings in Chapter Four. Two of the nine postulates were eliminated because they were specific to the field of epidemiology and not considered relevant to social science research.<sup>32</sup>

##### 5.4.5.1 Postulate One: Strength of the Relationship.

This postulate seeks to demonstrate the strength of the relationship between the use of PPPs and project duration (PCT) for new residence hall developments at public universities. If this relationship is proven to be strong, it is less likely that the relationship observed is due to chance or the existence of a confounding variable. First of all, the study applied replication logic to show that the individual PPP projects that were predicted to have shorter project duration than traditionally-procured projects, did indeed display those results. The research used two case studies, which is analogous to creating two separate experiments, to demonstrate the relationship between PPPs and PCT.

Secondly, the data in the case studies were linked to the study questions (see Section 5.1) by using the analytical techniques of pattern matching, explanation building and cross-case synthesis. This analysis revealed a pattern of similar results in the outcomes when comparing the PPP projects embedded within each of the cases (a literal replication). In addition, a "theoretical replication" was observed when each university

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<sup>32</sup> Postulate number five makes reference to the concept of "biological gradient," which pertains to the response of an illness along a "growth-response curve." Postulate number eight refers to the ability of the researcher to perform experimental procedures to identify the causality. Arguably, neither postulate has direct applications in social science research.



chose a PPP arrangement for different reasons (strategic for UW Madison versus reactive for USC Upstate) while achieving similar outcomes. Through explanation building, the analysis outlines the causal links that define the transactions across the two cases and finds them to be similar in fundamental ways.

#### 5.4.5.2 Postulate Two: Consistency of the Relationship Across Situational Differences

The association observed between PPPs and project duration at different state universities, with different institutional characteristics, and with different decision-making processes, can be compared to the replication of laboratory experiments. Two dramatically different campuses were selected for this multiple-case comparison. USC Upstate and UW Madison are public universities that differ radically in terms of physical size, enrollment, resident-life culture and geographical setting, among other factors. However, the same outcome with regard to time savings was observed within each case after the choice was made to use a PPP to procure a new residence hall.

The research appears to substantiate the consistency of the relationship between the use of a PPP as a contract procurement method for the development of residence halls at public universities and the shorter Project Completion Time, across situational differences, when compared with traditional contract procurement methods.

#### 5.4.5.3 Postulate Three: Specificity of the Association

The application of Hills Postulate Number Three is as follows: If the observed association between a project's duration and its Contract Procurement Method is limited

to specific types of projects and sites (e.g., PPPs for student housing projects at public universities), and if there is no association between Project Completion Time and other possible causes of project delay, then the relationship supports causation (i.e., it can be isolated to a recurring set of events). In total, this research has focused on the use of PPPs in the development of student housing at public universities. This is a very specific type of transaction. In addition, the case study analysis successfully eliminated the predominant alternative explanations for the observed relationship between the use of PPPs and Project Completion Time.

The research demonstrates a specific association between the use of a PPP as a contract procurement method for the development of residence halls at public universities and a shorter Project Completion Time, when compared with traditional contract procurement methods.

#### 5.4.5.4 Postulate Four: Temporality of the Relationship

The question of “temporality in relationship” considers whether or not one event always precedes the other. In other words, does the existence of a slow, politically-laden, traditional project approval process always precede the choice of a PPP, which, in turn, precedes the shortening of project duration, consistent with similar student housing development projects? The observed PPP transaction logic in each of the case studies makes the answer to this question a compelling “yes.” Evidence of the temporality of the relationship between the use of PPPs and Project Completion Time was observed through

the pattern matching analysis and in the comparison of the explanation logic built around each case.

#### 5.4.5.5 Postulate Six: Plausibility of the Relationship

The plausibility of a relationship can be determined if there is a known or postulated mechanism (e.g., as expressed in the literature) by which the choice of using a PPP might reasonably alter a project's duration. The current research builds on the theory of "decision point analysis," which proposes that a state procured residence hall would take longer to build than if a PPP were used. There are a number of articles in the public policy literature that refer to the problems caused by regulatory externalities (Pressman & Wildavsky, 1973; Wolf, 1978; Glenny & Schmidlein, 1983; Hearn & Griswold, 1994). In addition, there is a literature providing evidence of the ability of PPPs to expedite the provision of student housing initiatives at public universities (Goldstein, 2006; Bekurs, 2007; Sansiervo, 2010). Therefore, because of the existing literature in related areas, one can assume that the relationship between the use of a PPP as a Contract Procurement Method for the development of residence halls at public universities and the decline in Project Completion Time is highly plausible.

#### 5.4.5.6 Postulate Seven: Coherence

A theory about an observed relationship between variables is coherent when it agrees with other generally known facts about the phenomenon being examined. The choice of a PPP and the resulting shorter project duration in the development of residence

hall projects coincides with other, generally known facts related to the PPPs. For example, Bekurs (2007) notes that PPPs can provide a university access to a wider variety of project financing options and more highly skilled personnel. Similarly, Goldstein (2006) refers to the conventional wisdom among student housing officers that projects are typically completed more quickly when PPPs are involved. Thus, the relationship between the use of a PPP as a Contract Procurement Method for the development of residence halls at public universities and the reduction in Project Completion Time appears to be coherent based on other factors that are known about PPPs.

#### 5.4.5.7 Postulate Nine: Analogy

This postulate considers whether or not there are analogous situations against which the PPP - PCT relationship can be compared. The phenomenon of government outsourcing of various business functions, in general, is comparable to what has been observed in student housing. The goal has been to rely on market forces to create efficiencies wherein the benefits ultimately accrue to the taxpayer. One prominent example was the construction of thousands of military housing units at major U.S. military base locations by private, third-party contractors (Lynch, 2005). The units were delivered at a lower cost per square foot, and more quickly, than if the Department of Defense had done the work through traditional government channels based on subsequent government audits. Thus, the relationship between the use of a PPP as a contract procurement method for the development of residence halls at public universities and the

reduction in Project Completion Time appears to be analogous to other circumstances where public policies have been established to encourage the outsourcing of capital projects.

Based on the satisfaction of the relevant postulates put forth by Sir Austin Bradford Hill (1965) as shown above, one can conclude that the relationship observed between the use of PPPs to build residence halls at public universities and the reduction in Project Completion Time is causative rather than associative.

## 5.5 Conclusion

### 5.5.1 Response to Study Questions

In section 5.1.1, Study Question 1 posed the following question: How does the relationship between choosing a PPP as a student housing Contract Procurement Method and Project Completion Time work? Section 5.4.2 attempted to answer this question by showing causal links in the decision-making process for choosing to use a PPP for a residence hall project through two case studies. The key causal links in residence hall transactions at state universities that use PPPs are (1) the identification of an immediate demand for on-campus student housing, (2) the assessment of high political risk regarding the university's ability to complete a project in a timely manner through the traditional capital procurement process; (3) the expectation that using a PPP will be a more expedient way to build a new residence hall, with quality and cost variables held constant.

Study Question 2 asked: How is this relationship influenced by the state regulatory environment? Both case studies exhibited complex capital project approval processes at the state level. As a result, there were numerous points of political risk whereby funding could be denied, even though a project had already been vetted at previous levels in the approval process. In reaction to this perceived and actual risk, both universities used PPPs to expedite the completion of residence hall projects. By applying analytical approaches that included pattern matching and a cross-study synthesis, it was determined that the use of PPPs resulted in a reduction in Project Completion Time (which is analogous to project duration) because the sponsoring institutions were able to avoid the degree of project oversight (and expected delays in approval related to the variable Regulatory Status) that traditionally-procured projects would have had to undergo.

In each case, PPPs were used where there was a need to acquire land. The institutions could have purchased the land directly and built the proposed residence hall using the traditional capital procurement process, but chose not to because of the perceived risk of project delays related to the regulatory oversight process (i.e., political risk). State laws in South Carolina and Wisconsin require that public agencies advertise their intentions to acquire real estate. This may have caused the price of surrounding parcels to rise artificially, which, in turn, could have created greater upward pressure on each project's overall construction costs. Using a third party to purchase the land and develop a residence hall provided each institution with price protection with respect to the land and expediency in regard to project delivery.

By following the rigorous analytical regime laid out in the methodology designed for this case study, and supported in the literature on case study analysis, and by addressing the concerns of Hill's Postulates (Hill, 1965), this research suggests, that the choice of PPP does, in fact, matter and can result in a shorter Project Completion Time when compared to traditionally-procured residence hall projects at state schools. These results serve to strengthen the generalizability of the findings from the least squares model in Chapter 4 and suggest that a similar result of reduced Project Completion Time for student housing would be found for all four-year public institutions of higher education in the United States, with possible implications for two-year as well as private colleges.

## CHAPTER SIX

### CONCLUSION, STUDY LIMITATIONS AND FUTURE RESEARCH

#### 6.1 Conclusion

This research has found that the use of public-private partnerships (PPPs) as a contract procurement method to build residence halls at state universities in the United States can add value in measurable ways at an institutional level. By reducing project completion time, the PPP can increase a project's value by accelerating the receipt of cash flows from the project. Based on the tenets of capital budgeting and modern portfolio theory, an increase in one asset's net present value will increase the overall value of the school's portfolio of real estate assets, assuming that risk and other factors are held constant. At the same time, being able to bring housing units to market more quickly allows the school to meet existing student demand for on-campus accommodations and enhances the university's overall value proposition in an increasingly competitive market for college students.

The research also reveals that the structure of the state higher education regulatory environment can influence university administrators' perceived and real need to use a PPP. Complex regulatory structures with budgetary approval authority are often perceived by state college administrators as being an impediment to the school's ability to manage its student housing construction program effectively. The research provides evidence that, in fact, certain types of regulatory structures in higher education do create more of a Regulatory Drag that impedes the ability of public universities to complete



student housing projects in a timely manner. Depending on the urgency attached to moving a student housing project forward, the anticipation of Regulatory Drag appears to create a perceived need for some administrators to circumvent traditional procurement protocols and pursue private development solutions.

As a proxy for a pro-active asset management environment, the existence of a student housing plan does not appear to have a meaningful influence on shortening Project Completion Time. However, having a plan in place, as distinct from a master plan, does appear to have a strong positive impact on project efficiency.

The study introduced three new concepts to the construction science, public finance and public policy literature: Project Completion Time, Time Value of Service and Regulatory Drag. The concept of Project Completion Time helps to broaden the understanding of the factors that influence the ability of a public institution of higher education to complete a student housing project in a manner that meets student demand. The construction science literature currently focuses on measures of project performance with respect to the beginning and ending of actual work by the general contractor. The innovation introduced by this research is that Project Completion Time considers that a project begins the day when it has been formally approved to move forward. Future research can now consider factors that extend beyond project-specific attributes that affect project duration, to include both institutional and regulatory influences.

In a public sector context, Project Completion Time is closely linked to another concept introduced in this research, the Time Value of Service. In a financial context, by moving the student housing project forward by two years (the average time saved based

on the results of the study) real value is created for the university. In finance theory, the Time Value of Money suggests that money received sooner is more valuable than money received later. Accordingly, by accelerating the availability of the space and cash flows by two years, a resident hall project's value to the sponsoring university is increased because the dollars from room fees are received sooner and students' needs are met, on average, two years earlier. A decrease in Project Completion Time increases the overall net cash flow to the project because some of the costs that are easily impacted by price inflation (e.g., materials cost) and interest on construction debt can also be reduced when the project is completed more quickly.

With respect to the delivery of public goods and services, financial measures are necessary but not sufficient performance indicators. The concept of Time Value of Service is an attempt to capture a key lesson learned from this research whereby “a service rendered more quickly is a service rendered more valuable.” At its root, this concept suggests that, the more quickly that a university can respond to the demand for housing services, the greater will be the value of these services to students. Therefore, in decreasing the average Project Completion Time of residence hall construction, PPPs provide a social as well as a financial benefit.

This research also introduces the concept of Regulatory Drag. A small body of literature exists that focuses on state higher education regulatory structures. However, for the first time the adverse impact of state regulation on new student housing projects at public universities has been quantified. The results indicate that certain regulatory structures can have a statistically significant adverse impact on project completion time.

In states where regulators have budgetary approval authority, residence hall construction projects take two years (on average) longer to complete when the traditional capital procurement process is followed compared to the results from using a PPP arrangement. The effect of Regulatory Drag can impact the overall competitiveness of public universities and has implications for the future design of public policy and public finance in higher education.

While the ability to generalize the findings of this study might be limited to four-year, state-supported universities in the U.S., the implications extend much further. The findings will hopefully lead to the development of a set of metrics that allow all universities to manage their real estate portfolios more effectively on a long-term basis.

## 6.2 Study Limitations

One limitation of the research stems from the fact that this study did not attempt to examine in any detail the financial motivation behind the demand for PPPs by state universities. The fact that rising debt and interest payments may be driving some schools to seek off-balance sheet solutions to their student housing needs is very real. A recent article in *The Economist* (2012) points to the fact that from 2002 to 2008 total long term debt on the balance sheets of US colleges and universities increased by 12 percent on average, with interest payments increasing by almost 10 percent over the same time period. The recent financial crisis would have only exacerbated this trend. However, an

analysis of the total-debt-to-net-assets ratios<sup>33</sup> of 16 two and four-year colleges that had completed PPP projects (Baum, 2011) found no indication of a relationship between the use of PPPs to build new residence halls and financial leverage. The data showed that some universities with a very high debt to net asset ratio (e.g. 93 percent for Central State University) and some with very low ratios (e.g., eight percent for Georgia Southern University) had used a PPP to develop new student housing. See Appendix H for a table of the results of this analysis.

### 6.3 Future Research

The present research offers valuable insights into the nature of the relationship between PPPs, the state regulatory environment and a new measure of project performance, Project Completion Time. This study focused on a total of 43 projects, 28 using the traditional procurement process and 15 using PPPs. The findings could be significantly strengthened with more data gathered from more projects across the country.

By surveying more universities and collecting more project information, future research efforts will be able to establish the influence of regulatory structure (also called regulatory drag) on the Project Completion Time of (1) traditional projects alone and (2) PPPs alone, to compliment the findings of this study. The finding that certain state regulatory environments negatively influence the Project Completion Times of traditionally procured projects, when considered as a separate group, would reinforce the policy implications of the current study. In a similar vein, the finding that certain state

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<sup>33</sup> These ratios were calculated using financial statements from the respective institutions for the year the project bond financing was completed.

regulatory environments negatively influence Project Completion Times of PPP projects would reinforce the observations of Lee White, Senior Vice President of George K. Baum & Company (Interview granted December 7, 2011) that some states are more difficult to work in than others.

The use of student housing plans appears to be a growing trend at state universities, based on an interview with Deborah Grander, Director of Residential Life, University of Maryland (Interview granted May 15, 2012) and member of the Association of College and University Housing Officers - International. Having a larger sample size of universities with student housing projects might provide additional insights into the nature of the relationship between the existence of a student housing plan and project performance. This study found that having a student housing plan had no significant relationship to project duration. In regard to project efficiency, the results of this research may be questionable because only five of the projects in the sample using PPPs and nine in the traditional group were at schools with student housing plans in place. Future research using a larger sample may reveal additional insights into the nature of the relationship between the existence of a student housing plan and project performance (with or without PPPs).

This research does not address the question of how the theoretical value created by the use of a PPP is actually captured. It is clear that the acceleration of cash flows can help an institution meet its fiscal objectives. Also, the more quickly a university can create new residential housing space, the faster it can meet student housing needs. However, the research did not go into detail regarding the mechanism by which cash

flows or other measures of value created are translated into more and better student-centered outcomes. This is another area for future research.

It would also be valuable to have a deeper understanding of how PPP projects meet other performance criteria set by university administrators. For example, knowing how satisfied university administrators are with the final PPP product when compared to the traditional alternative (e.g., with respect to structural quality, customer service, cost, etc.) would provide helpful insights into additional tradeoffs faced in the PPP decision process. It would also be useful to know to what extent are PPPs used as a strategic asset management tool versus a reactive mechanism in the face of an obdurate bureaucracy. This type of information would provide guidance to future policy design efforts at both the institutional and state regulatory levels.

Another area of focus not addressed in the research, but important from the policy maker's perspective, is the level of comfort that college administrators and other stakeholders have regarding the introduction of PPPs as a supply-side student housing solution. In his recent book, *What Money Can't Buy*, Sandel (2012) notes:

“When we decide that certain goods may be bought and sold, we decide, at least implicitly, that it is appropriate to treat them as commodities, as instruments of profit and use. But not all goods are properly valued in this way (p. 9).”

Indeed, residence halls and other campus buildings should not be valued solely on their ability to produce financial results. Performance measures based only on a building's economic contributions fail to account for the campus' role in the development

of students' citizenship skills, ethical values and respect for the long-standing principles of the institution's founders. Rather, it may ultimately be in its ability to ignite in students an appreciation for life-long learning that the true measure of the successful campus lay. This is also a very fertile area for future research.

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## APPENDICES

## Appendix A Guidelines for Comprehensive Student Housing Plans in the University System of Georgia

Each institution that provides, or plans to provide, a residential student program shall develop a student housing comprehensive plan that addresses all facets of the creation, expansion, and operation of the student housing facilities.

The student housing plan will address the:

1. Academic mission;
2. Specific role or purpose of student housing within that mission including student life programs;
3. Access to the campus or other needs;
4. Enrollment projections in relation to housing goals, geographic, economic, and demographic factors at the institution and in the local community; and,
5. Financial considerations, including an evaluation of the desirability and practicality of achieving these student housing objectives through private sector partnerships on institution lands or lands proximate to the institution.

The student housing plan will include the following:

1. A business plan that explains the role of the student housing program in the context of the institution's academic mission, includes concrete goals and objectives, and defines an operating strategy including marketing plans, programs and services, fees, assignment of indirect costs, and use of reserves for repair and maintenance, major renovation and, if planned, expansion of capacity. The plan should also contain a financial pro forma that projects future revenues and expenditures consistent with stated goals and objectives and includes plans for capitalization, maintenance and operations, and facilities renewal;
2. A facility evaluation assessing the appropriateness of rehabilitation versus demolition and new construction;
3. A market needs assessment, including justification for additional student housing capacity where appropriate; and,
4. The housing facilities component of the institution's physical master plan, including site, circumstance, and impact on other campus functions.

Source: University System of Georgia, Board of Regents Policy Manual. Retrieved October 21, 2012 from: <http://www.usg.edu/policymanual/section7/C480/>.

## Appendix B Example of Survey Email Message

Thu, Mar 15, 2012 at 11:46 PM

**Bruce Cole**< bcole@g.clemson.edu>  
To: tmurphy1@utk.edu  
Cc: ttomlins@utk.edu

Dear Mr. Murphy:

I hope this email finds you well.

My name is Bruce Cole. I am a Ph.D. candidate at Clemson University. The purpose of this email is to request your assistance in helping me identify and collect information on the on-campus dormitories that have been built by the University of Tennessee (Knoxville Campus) since 2000.

As part of the research for my doctoral dissertation, I will compare data collected from student housing projects completed through public-private partnerships with non-PPP dorm projects like yours from across the country. I have attached a copy of a data collection sheet which indicates the information I hope to collect for each dorm project you have completed over the past 12 years. I would appreciate any help you can provide in completing the form and obtaining a copy of the (1) certificate of occupancy, (2) minutes indicating project approval by the board of trustees, (3) the architect contract signature sheet and the (4) general contractor's contract signature sheet for each project.

The requested information will help us determine under what circumstances public universities tend to use PPPs and whether they are able to achieve their policy objectives through this project delivery method. Please note that I am willing to share the results of my research with your organization. If you don't mind, I may ask one of my students to follow-up on this request.

Thank you, in advance, for your assistance.

Best regards,

Bruce Cole

Bruce K. Cole, CPA  
Ph.D. Candidate  
Clemson University  
c: 864-207-6781

Appendix C Sample of Data Collection Form

Date:		Form Number:	
School:			
Contact Name:	Title:	Phone:	
		Email:	
Enrollment that yr:	Number Beds:	Student Housing Plan: (1)Yes ___ (0)No ___	
Dormitory Project Name:	Materials Used:	Building Style:	
	(0) Institutional (Steel frame & concrete floors) ___	(0) Apartments ___	
	(1) Wood frame and wood Floors ___	(1) Townhomes ___	
Location:	(2) Hybrid ___	(2) Suites ___	
		(3) Other ___	
		Describe: Dormitory Style	
Gross Square Feet:	Total Cost:	Year Built:	CO Date:
Construction Delivery Method:	(0) Design-Bid-Build ___ (2) CM at Risk ___		
	(1) Design-Build ___ (3) Other (explain) ___		
Contract Procurement Method:	(0) Traditional State Procurement Process ___		
	(1) Other ___		
Developer Relationship:	(0) Vendor ___		
	(1) PPP ___		
Dormitory Management Services Provided by:	(0) College or College Auxiliary: ___		
	(1) PPP Partner: _____		
	(2) Other: _____		
Ownership Type:	(0) University ___		
	(1) University Foundation ___		
	(2) Private Foundation ___		
	(3) Third Party Equity (Name) ___		
State Regulatory Environment:	(0) Consolidated ___		
	(0) Coordinated (Program Approval) ___		
	(1) Coordinated (No Program Approval) ___		
	(1) Planning Agency ___		
Assets in Year Financed:	Liabilities in Yr Financed:	Debt/Asset Ratio in Year Financed :	
B of Regents Auth. Date:	Contractor Sign Date:	Architect Signature Date:	

Appendix D Analysis of Variance for the Relationship between Average State Population and PPPs



<b>Summary of Fit</b>				
RSquare			0.562351	
RSquare Adj			0.553233	
Root Mean Square Error			5.890355	
Mean of Response			5.82	
Observations (or Sum Wgts)			50	
<b>Analysis of Variance</b>				
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	2139.9582	2139.96	61.6769
Error	48	1665.4218	34.70	<b>Prob &gt; F</b>
C. Total	49	3805.3800		<.0001*
<b>Parameter Estimates</b>				
Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	-0.156163	1.128266	-0.14	0.8905
Pop/mm	1.0148443	0.129223	7.85	<.0001*

	Total Project Cost (Millions)	Student Occupancy	Project Size (SF)	Cost Per Student	Cost Per SF	SF Per Bed
All Reporting Colleges	\$ 33,120,000	428	131,782	\$ 78,153	201.1	351.2
< 200 beds	\$ 8,534,161	128	55,000	\$ 92,176	206.74	430.0
201 < > 501 beds	\$ 21,190,000	356	124,400	\$ 64,570	189.16	337.1
> 501 beds	\$ 56,298,000	618	225,000	\$ 91,578	256.96	309.6
Northeast	\$ 51,000,000	506	156,400	\$ 107,234	337.93	309.1
Southeast	\$ 17,622,800	351	122,000	\$ 58,125	166.67	323.4
Midwest	\$ 33,236,000	455	288,250	\$ 84,643	189.16	386.9
Southwest	\$ 20,140,000	400	124,400	\$ 54,887	170.78	311.0
West	\$ 43,920,000	352	131,782	\$ 95,455	229.09	337.0

Note: All figures shown are median figures.

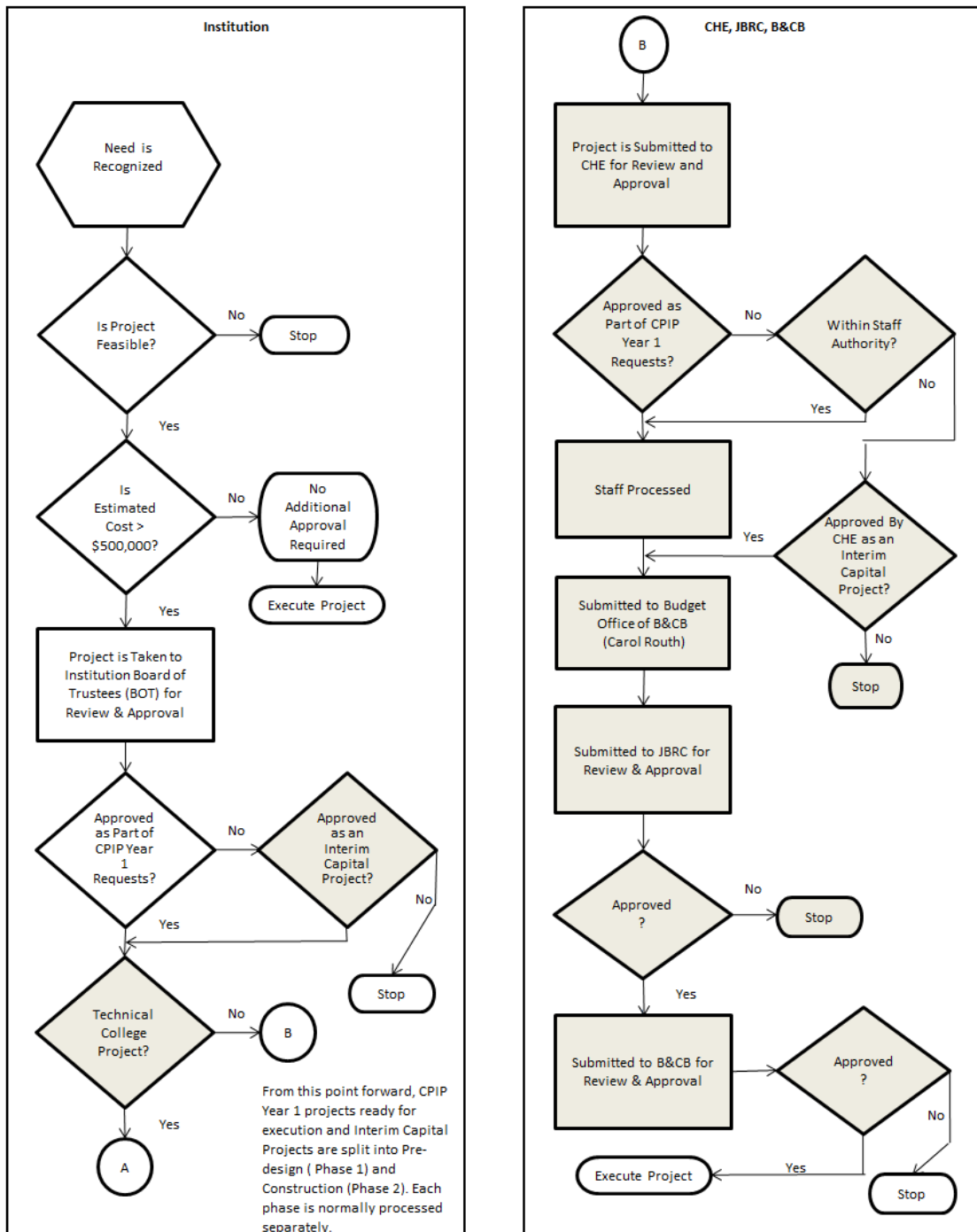
Source: Abramson, 2011

Appendix F Authority of State Boards of Higher Education

Consolidated Governing Board		Coordinating Boards						Planning Agencies
Budget Approval Authority		No Budget Approval Authority						
Board for All Senior Institutions.	Board for All Senior Institutions, Separate Agency for Community Colleges	Consolidated or Aggregated Budget	Budget Review and Recommendation Only	No Statutory Budget Role	Consolidated or Aggregated Budget	Budget Review and Recommendation	No Statutory Budget Role or Program Approval	No Review/Oversight Authority
Alaska Georgia Hawaii Idaho Maine Massachusetts Montana Nevada North Dakota Rhode Island South Dakota Utah West Virginia	Arizona Florida Iowa Kansas Mississippi New Hampshire North Carolina Oregon Wyoming Wisconsin	Alabama Connecticut Illinois Maryland New Jersey Ohio Oklahoma So. Carolina	Colorado Indiana Kentucky Louisiana Missouri Pennsylvania Tennessee Texas Virginia Washington	New York	Arkansas	California Minnesota	New Mexico	Delaware Michigan Nebraska Vermont

Adapted from McGuinness (1988), p. 11. Note the shaded area represents the states with no capital budget approval authority.

Appendix G South Carolina State Capital Project Approval Process



Source: SC Commission on Higher Education  
 Appendix H Ratio of Debt to Net Assets for Selected Colleges and Universities

<u>School</u>	<u>Debt/Net Assets Ratio</u>
Georgia Southern University	0.08
University of Delaware	0.15
Georgia Southern University	0.21
Oklahoma State University Phase 3-B	0.23
University of Arizona	0.28
University of North Texas	0.42
University of Cincinnati	0.45
Temple University	0.48
San Diego State University Aztec Shops	0.49
Rogers State Univ	0.52
Temple University	0.55
University of Cincinnati	0.60
West Chester University of PA	0.72
California Baptist University	0.79
California Baptist University	0.82
Central State University Phase 2	0.93

Source: Researcher's calculations using data from Baum, 2011 and annual reports for the year PPP was financed.

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Why do we do this?

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Appendix I (Cont.)

**2.0 Permission from Clemson University to Use Photo of Tillman Hall**

**CLEMSON UNIVERSITY**

OFFICE OF PHOTOGRAPHIC SERVICES  
Department of Publications and Promotion  
114 Daniel Dr.  
Clemson, SC 29601  
www.clemson.edu

**COPYRIGHT RELEASE**

OUTDOOR CLASSES  
Title of Photograph(s)

STUDENTS HAVING CLASS / TILLMAN HALL IN  
Description of Photograph(s) BACKGROUND.

I certify that I am the legal copyright author for the photo(s) described above. I authorize copies of the photo(s) described above as set forth in the following:

ONE  
Number of Copies / Sizes

N/A  
Date Permission Expires

CYNTHIA R. GOSEY  
Copyright Author Name

Cynthia R. Gosey  
Copyright Author Signature

114 DANIEL DRIVE  
Address

864 859-2408  
Phone

07-02-12  
Date

Appendix I (Cont.)

### 3.0 Permission from University of South Carolina Upstate to use photos of Palmetto and Magnolia Halls.



Bruce Cole <bcole@g.clemson.edu>

---

## Request for permission to use photo of Palmetto and Magnolia Halls

2 messages

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**Bruce Cole** <bcole@g.clemson.edu>

Sat, Aug 18, 2012 at 7:02 PM

To: "CONNELLY, BOB A" <bconnelly@uscupstate.edu>

Dear Bob:

I hope this email finds you well.

My doctoral dissertation is just about complete. Thank you for all of your help in getting me started on this journey. It has come to my attention that I have not obtained formal permission from USC Spartanburg to use the photo you sent me of the two residence halls we discussed. Can you grant that permission yourself or direct me to the folks who can?

By the way, I would be more than happy to send you a copy of the dissertation (200 pages - Great for bedtime reading!!!) or a summary if you prefer.

Thank you, again, for your support of my research.

Best regards,

Bruce

Bruce K. Cole, Ph.D. Candidate

Clemson University  
c: 864-207-6781

---

**CONNELLY, BOB A** <BCONNELLY@uscupstate.edu>

Mon, Aug 20, 2012 at 10:43 AM

To: Bruce Cole <bcole@g.clemson.edu>

Cc: "IRVIN, MIKE" <MIRVIN@uscupstate.edu>, "PERRY, JOHN F" <JPERRY@uscupstate.edu>

Bruce, you have permission to use the aerial photo of the two dormitories on the USC Upstate campus for your dissertation. Good luck on the degree work.

Appendix I (Cont.)

**4.0 Permission from University of Wisconsin (Jeff Miller) to Use Photos of Smith and Ogg Halls**



**Bruce Cole < bcole@g.clemson.edu >**

---

**Re: Permission request, Ogg and Smith Halls**

1 message

---

**Jeff Miller** < jbmille1@wisc.edu >

Tue, Jul  
31, 2012 at  
4:19 PM

To: Bruce Cole < bcole@g.clemson.edu >

Cc: Jeff Miller < jbmille1@wisc.edu >

Hi, Bruce,

Thanks for the follow up. I don't not recognize either of the facilities photos in the attached documents as being content that our office created, and therefore am not able to grant or deny permission for use. Both photos appear more architectural in nature and look like something you \*may\* have acquired from a planning or architectural source.

If helpful, you are welcome to consider, download and make complimentary use of the following low-res news photos highlighting each facility in your dissertation project. Please credit any such photography to the photographer/University of Wisconsin-Madison.

<http://photos.news.wisc.edu/photos/list?search=newell+smith+hall>

<http://photos.news.wisc.edu/photos/list?search=ogg+hall+%21newell>

I hope this helps,

Best wishes.

Jeff

~~~~~  
~~

Jeff Miller, senior photographer Email: jbmille1@wisc.edu  
University Communications  
University of Wisconsin Madison Phone: 608/262-0067  
711 State Street, Suite 200, Madison, WI 53703 Fax: 608/262-9065

On Jul 31, 2012, at 3:09 PM, Bruce Cole wrote:

Dear Jeff:

I enjoyed speaking with you this afternoon.

Per our conversation, I am a Ph.D. candidate at Clemson University. I am seeking permission to use photos of the New Ogg Hall and Smith Hall for my dissertation. The subject of my thesis involves the use public-private partnerships in the development of new student housing at public universities.

Attached are copies of two photos that I have found suitable for my needs. Unfortunately, I do not have link information for their source. However, if there are other, similar photos available in your catalog, I welcome the opportunity to use those instead.

Thank you, in advance, for your help.

Best regards,

Bruce  
Bruce K. Cole, Ph.D. Candidate  
Clemson University  
c: 864-207-6781

## Appendix J List of Research Contacts

| <b>Name</b>          | <b>Title</b>                                                                                  | <b>Organization</b>                                  |
|----------------------|-----------------------------------------------------------------------------------------------|------------------------------------------------------|
| Aderholdt, Mark      | Assistant Director, Design & Development                                                      | Auburn University                                    |
| Baird, Yun Lee       | Director of Capital Projects, Housing Srvcs. Admin                                            | UC Riverside                                         |
| Barker, James        | President                                                                                     | Clemson University                                   |
| Barnette, Al         | Senior Vice President                                                                         | EAH, Inc.                                            |
| Beck, Mark           | Director of Capital Planning                                                                  | University System of Maryland                        |
| Bernhards, John      | Associate Vice President                                                                      | APPA <sup>1</sup>                                    |
| Boston, Terry        | Assistant Vice President of Administrative Services, Office of Student Affairs and Enrollment | Washington State University                          |
| Bowes, William R.    | Vice Chancellor for Fiscal Affairs                                                            | University System of Georgia                         |
| Brennen, Robert      | Executive Director                                                                            | Maryland Economic Development Corp.                  |
| Butts, Calvin        | President                                                                                     | State University of New York College at Old Westbury |
| Cagle, Susan         | Director, Inst. Finance & Facilities                                                          | Alabama Commission on Higher Education               |
| Cardenas, Rudolph    | Associate Vice Chancellor for Facilities Management                                           | Fayetteville State College                           |
| Chambers, Channon    | Capital Projects Code Compliance                                                              | Clemson University                                   |
| Cobb, Floyd          | Fire Marshall                                                                                 | Oklahoma State University                            |
| Conlon, Scott        | Director of Projects, Facilities Design and Construction                                      | The Ohio State University                            |
| Connelly, Robert     | Vice Chancellor for Business Affairs                                                          | University of South Carolina Upstate                 |
| Core, Ronald, Ph.D.  | Vice President Business & Finance                                                             | Georgia Southern University                          |
| Corrigan, Michael T. | Vice President\Deputy Executive Director                                                      | Dormitory Authority of the State of New York         |
| Crouch, Joseph E.    | Architect, Facilities Information and Space Planning Project Manager                          | University of Kentucky                               |
| Crutcher, Ben        | Associate Vice President for Auxiliary Services                                               | University of Kentucky                               |
| Dahl, Gary           | Director of Project Management                                                                | UC Davis                                             |
| Davis, Grant         | Secretary to the Board of Trustees                                                            | Auburn University                                    |
| Donnelly, Maura      | Senior Architect and UW System Preservation Officer                                           | University of Wisconsin                              |
| Drummond, Theresa    | Administrative Assistant, Board of Trustees                                                   | Ohio State University                                |

| <b>Name</b>         | <b>Title</b>                                                         | <b>Organization</b>                   |
|---------------------|----------------------------------------------------------------------|---------------------------------------|
| Givhan, Will        | Chief Operating Officer & General Counsel                            | Collegiate Housing Foundation         |
| Glazner, Steve      | Director of Knowledge Management                                     | APPA <sup>1</sup>                     |
| Glenn, Gary         | Director of Finance, Facilities, & MIS                               | SC Commission on Higher Education     |
| Grander, Debra      | Director of Residential Life                                         | University of Maryland, College Park  |
| Harrison, Kenneth   | Mgr., Risk Management & Safety                                       | Auburn University                     |
| Hayakawa, Mary      | Exec. Dir., Real Estate Services                                     | UC Davis                              |
| Hayes, Darlene      | CBRE Appraisals                                                      | CBRE National Student Hsg Group       |
| Hopke, James        | EVP Project Management & Construction                                | American Campus Communities           |
| Horn, David         | Secretary to the Board of Trustees                                   | Ohio State University                 |
| Hudak, Randal       | Associate Vice President Facilities & Services                       | West Virginia University              |
| Kaptik, Michael     | Director of Student Housing                                          | University of Hawaii                  |
| Kinderman, Mike     | Director of Student Housing                                          | University of Wisconsin - Madison     |
| King, Daniel        | Asst. VP Facilities                                                  | Auburn University                     |
| Kirby, Gwen         | Senior Office Associate, Office of the Board of Regents              | The Texas A&M University System       |
| Knoll, Judy         | Operations Program Associate, Capital Planning and Budget            | University of Wisconsin System        |
| Kraus, Brian        | Director, Systems & Financial Reporting                              | Kansas State University               |
| Landi, Becki        | Executive Assistant to the Board of Regents, Office of the President | Washington State University           |
| Langdon, Rachel     | Administrative Assistant                                             | Office of the State Engineer          |
| LaRose, Stu         | Architect & Project Manager                                          | University of Wisconsin Madison       |
| Lentino, Pete       | Planning Superintendant                                              | UC Davis                              |
| Levens, Darlene     | Asst. to Board of Regents                                            | Texas A&M                             |
| Lieu, Amy           | Administrative Assistant                                             | Maryland Economic Development Corp.   |
| Luna, Gene          | Associate Vice President for Student Affairs and Academic Support    | University of South Carolina Columbia |
| Lynn, Katherine     | Director                                                             | Alabama State Building Commission     |
| Makley, Paul        | Chief Financial Officer                                              | Tandem Properties, Inc.               |
| McUmbler, Christine | Director, Administrative and Resource Management                     | UC Davis                              |

| <b>Name</b>                | <b>Title</b>                                                         | <b>Organization</b>                   |
|----------------------------|----------------------------------------------------------------------|---------------------------------------|
| Michael, Thomas            | Accounting Supervisor                                                | Georgia Southern University           |
| Miller, David              | Associate Vice President, Capital Planning and Budget                | University of Wisconsin System        |
| Moore, Ashlynn             | Facility Planner                                                     | Fayetteville State College            |
| Mungo, Rein                | Director, University Projects and Planning                           | Coastal Carolina University           |
| Murphy, Ted                | Interim Assistant Director of Design, Facilities Services Department | The University of Tennessee           |
| Murtagh, Mary              | President                                                            | EAH, Inc.                             |
| Nicolosi, Margaret W.      | Campus Architect                                                     | Auburn University                     |
| Norman, Debra              | Sr Exec. Associate, Office of the Sec. of the University             | Rutgers University                    |
| Orback, Eric               | President                                                            | UGA Real Estate Foundation, Inc.      |
| Page-Cook, Joni            | Office Manager, Residence Life                                       | Texas A&M University                  |
| Paladino, Christopher      | President                                                            | Devco                                 |
| Perry, John                | Executive Director, University Boards and Public Affairs             | University of South Carolina, Upstate |
| Puncke, Rick               | Director, Facilities Management Department                           | University of South Carolina, Upstate |
| Racicot, Richard W.        | Executive Director, UC Riverside Capital Programs                    | UC Riverside                          |
| Reid, Ryan                 | National Director                                                    | CBRE National Student Hsg Group       |
| Reinhardt, William G.      | Editor/Publisher                                                     | Public Works Financing Newsletter     |
| Richards, Patricia         | Office Operations Associate, Fac Plng and Mgt                        | University of Wisconsin               |
| Richardson, Richard C. Jr. | Professor Emeritus                                                   | New York University                   |
| Roessler, Mark             | Director of Capital Projects, Residence Halls                        | University of Wisconsin Madison       |
| Rung, Lee Ann              | Secretary to the Council on Higher Education                         | Commonwealth of Virginia              |
| Sheehan, James             | Vice Chancellor for Administration & Finance                         | University of Massachusetts-Amherst   |
| Sheppard, Margaret         | Executive Support Assistant, AVC Finance                             | UC Davis                              |
| Shulack, John              | Executive director of University Facilities                          | Rutgers University                    |
| Shulack, John F.           | Senior Executive Director University Facilities                      | Rutgers University                    |
| Stinebaugh, John           | Managing Director                                                    | Brookfield Infrastructure Funds       |

| <b>Name</b>            | <b>Title</b>                                                     | <b>Organization</b>                                   |
|------------------------|------------------------------------------------------------------|-------------------------------------------------------|
| Stradley, Craig        | Architect                                                        | Mogavero Notestine Associates                         |
| Temple, Lynette        | Director of Legal Services                                       | UC Davis                                              |
| Tillman, Thomas        | Director, Campus Planning & Space Mgt                            | Auburn University                                     |
| Turchi, Elodie         | Public Affairs Consultant                                        | Organization for Economic Cooperation and Development |
| Van der Mey, Gerald    | Director, Campus Planning                                        | Clemson University                                    |
| Voss, Todd             | President                                                        | Southern Wesleyan University                          |
| Wagley, Jay            | EVP Debt & Equity,                                               | CBRE National Student Hsg Group                       |
| Wells, Robert          | Associate Vice President, University Facilities Support Services | Clemson University                                    |
| White, John            | State Engineer & CPO for Construction                            | State of South Carolina                               |
| White, Lee             | Executive Vice President                                         | George K. Baum & Company                              |
| Willbrant, Fran        | Assistant Vice President of Financial Services                   | Kansas State University                               |
| Williams, Paul T., Jr. | President                                                        | Dormitory Authority of the State of New York          |
| Williamson, Oliver E.  | Professor Emeritus                                               | UC Berkeley                                           |
| Wiseman, Robert        | Vice President, Facility Services                                | University of Kentucky                                |
| Wisnia, Elizabeth      | Information Practices Analyst                                    | UC Davis                                              |
| Zaddach, Randy         | A&M System Architectural Project Manager                         | Texas A&M                                             |

<sup>1</sup> APPA was originally organized in 1914 as the Association of Superintendents of Buildings and Grounds. The association later became the Association of Physical Plant Administrators of Universities and Colleges. In 1991, the name APPA: The Association of Higher Education Facilities Officers was adopted to reflect its members' increased responsibilities in higher education. In 2005, the association began to identify itself simply as APPA, in homage to its history, but also to be inclusive of other types of educational institutions.