Application of Transaction Cost Economics within the Facilities and Construction Industry to Improve Project Outcomes: A Case Study Approach

by

Michael L Rice

A Thesis Presented in Partial Fulfillment
of the Requirements for the Degree
Master of Science

Approved November 2019 by the
Graduate Supervisory Committee:

Kenneth Sullivan, Chair
Brian Stone
Jake Smithwick

ARIZONA STATE UNIVERSITY

December 2019

ABSTRACT

This thesis draws on industry experience and academic literature to highlight several problems facing the construction and facility management industries. These problems include issues with product delivery performance and financial failures that often lead firms to spend much more than anticipated, while obtaining much less of a product. Transaction-cost economics theory and literature are presented as a model for understanding, predicting, and preventing these problems. Transaction-cost economics suggests that specificity and uncertainty, two key characteristics of industry transactions, are improperly aligned with governance structures, leading to preventable failures. This thesis highlights several case studies in which these failures occur and argues that the correct application of this theory can mitigate many of these problems. A final case study illustrates how this alignment can make a difference in outcome without a compromise of quality.

DEDICATION

An enormous debt of gratitude to my wife and eight children, who have been more than patient and supportive on the many weekends and holidays spent on this research – *amor vincit omnia.*

TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

The industries of construction and facility management, hereafter referred to as the industry, can produce a challenging environment for both buyer and seller. Satisfaction for both parties may seem difficult to reach, sometimes on the simplest of projects. Despite the owners controlling the initial budget, schedule, selection methodology, award criteria, contract, scope, requirements, and design, they often face challenges in receiving successful construction outcomes. Challenges for sellers include poor productivity, change orders, buyer driven delays, contract disputes, cost overruns, and others.

In addition to issues of product delivery, the industry also experiences significant quantities of failure in construction companies of all sizes, ages, and nationalities. Peterson (2013) refers to research by Dun and Bradstreet to note that "since 1988 the construction industry has experienced a higher-than-average business failure rate when compared to the failure rate of all businesses (Peterson, 2013).

Peterson (2013) also refers to data from the Surety Information Office to assert that poor financial management is the primary source of business failure in the industry, citing "six broad warning signs that a construction company is in trouble", four of these six being directly related to financial management: "ineffective financial management systems…bank lines of credit constantly borrowed to the limits…poor estimating and /or job cost reporting…poor project management…no comprehensive business plan…[and] communication problems (Surety Information Office, 2003)" (as cited in Peterson, 2013, p.3). The two "warning signs" not related to financial management, poor project

management and communication problems, may be indicative of organizational rather than financial failures.

These four "warning sings" of financial management failure could be more specifically described by the following seven areas of poor financial management: "1. Improper accounting procedures and systems; 2. Failure to manage the company's cash flow; 3. Failure to accurately track and manage job and equipment costs; 4. Excessive overhead; 5. Failure to plan for and achieve an acceptable profit margin; 6. Excessive debt; and, 7. Failure to make business decision based on sound financial data" (Peterson, 2013).

Of this list, areas one and four seem self-explanatory; and, each of the other five are common in the industry. Number two illustrates the inconsistent and irregular nature of the industry, which requires standard accounting and financial procedures to be modified to be compatible with payment terms of the project, as well as unusual cash flows, periodic progress payments, and retention. Number three illustrates the disconnected nature of projects, scattered among various locations wherein "…employees and equipment must be tracked to ensure that their costs are charged to the correct job, and each must be managed as a profit center" (Peterson, 2013). Number five illustrates risk, uncertainty, and complexity as "…construction companies often give a fixed price for a product that the company has never built, or never built using the local suppliers and subcontractors available at the project location" (Peterson, 2013). Number six illustrates dependencies in the industry: a high demand for capital that may lead construction companies to utilize subcontractors to draw on their assets to expand labor, talent, or

financial capital during the construction process (Peterson, 2013). And, number seven, closely related to number five, could be characteristic of uncertainty.

In addition, the unique characteristics of space and time, or spatiotemporal characteristics, complicate the industry. According to Peterson (2013), no other industry is as project based – with builders often producing unique, one-of-a-kind custom projects with great variations from project to project and among various owners. These issues, along with differing site conditions, locations, labor, equipment, components, and materials make it difficult to forecast production costs; and, to bid future projects "to keep the company's workforce fully utilized", the company will need to know the costs of these differing mixes of variables for each project (Peterson, 2013). These unique industry characteristics create uncertainty, variable frequency, and a type of specificity that limits effectiveness between projects, making it impossible to "store unused production in slow times for use on other, future projects" (Peterson, 2013).

These challenges can be found in various magnitudes and combinations throughout the industry and have been the subject of numerous past research efforts. This thesis will explore reasons behind and suggest solutions for some of these industry concerns in the theory and case studies below.

Table 1 summarizes problems and related characteristics discussed above, a few of which were noted by Peterson (2013).

Table 1.

Summary of Facilities and Construction Industry Problems and Characteristics

Problems (Results)	Characteristics (Inputs)
Poor Performance – unwanted results	Inconsistency
dissatisfied buyers	Irregularity
delays	Variability
disputes	Disconnectedness
compromised quality	Uncertainty
compromised safety	Complexity
cost overruns	Risk
Company Failure	Dependencies and Relationships
poor financial management	Specificity
bankruptcy	spatiotemporal
poor organizational management	project based

CHAPTER 2

PROBLEM STATEMENT AND PURPOSE OF THESIS

The purpose of this thesis is to explain some of the characteristics and problems that stress the industry, causing performance and financial failures. This work proposes that there is a cause and effect relationship between the characteristics and resulting problems identified above that can support decision making, offer systematic predictability, and thus improve performance in the field.

Hypothesis Statement:

Construction and facility project performance may be predictable based on characteristics and organization of the project, making it possible to mitigate failure and optimize performance.

CHAPTER 3

THESIS OBJECTIVES AND SCOPE

Goal:

The goal of this thesis is to identify theory that will predict outcome, support efforts to reduce failure, and improve optimal performance.

Methodology:

Transaction-cost economics theory (TCE) is utilized as an analytical model to understand the characteristics of the construction and facility industry in relation to performance and outcome. TCE literature is laid out to identify relevant principles and how they relate to industry transactions.

Historical project data is presented to demonstrate a sense of uncertainty in project costs. Four case studies apply TCE principles to a contracted project, a contracted service, and two experiments with administrative controls, respectively. A fifth, and final case study applies the principles of TCE to four alternative projects to test for improved performance and reduced costs. The thesis then discusses data, results of the study, and concludes.

Scope:

This thesis uses a case study approach to recognize compelling relationships between TCE and transactions in the industry to understand project outcome in relation to industry characteristics and corresponding project organization; and, thus offer a valid theoretical base for further exploration of TCE applications in the industry.

CHAPTER 4

SUMMARY OF THESIS

This thesis proposes that problems within the construction and facility industry may be predictable and preventable once the logic behind the relationships in Table 1 is understood. Transaction-cost economics theory (TCE) provides a useful analytical model for understanding industry performance, or, in other words, the relationships between these industry inputs and outputs shown in Table 1. In TCE the primary inputs, or characteristics of a transaction, yield efficiency and optimal output when aligned with complementary forms of coordination otherwise known as organization, and often referred to in TCE as governance (Williamson, 1991). Put differently, TCE proposes that optimal performance results from aligning characteristics of transactions with their complementary forms of governance.

Oliver E. Williamson, who received the 2009 Nobel Memorial Prize in Economic Sciences; and, R.H. Coase, have both made significant contributions to TCE, and their works will be heavily utilized in this thesis. There is no attempt to further develop, add to, or criticize their works in this thesis. Rather, this thesis attempts to find applications for their brilliant work in construction and facility industry transactions. The works of others who have further developed TCE are also drawn upon for use in this thesis, each is cited throughout and then referenced at the end of this work.

Governance in TCE refers to three generic forms of coordination, or economic organization, in which to conduct production. These range along a spectrum, from the firm, or subordination, also known as hierarchy, at one polar end, to market, or autonomy, at the other end; and, hybrid forms of coordination in-between. These are

discussed in greater detail in chapter five. Subordination is found in firms, or organizations, generically termed hierarchy, where authority, represented by a servant-master relationship dictates the behavior of employees to carry out production. Autonomy, however, is found in market organization, where transacting parties realize greater ownership, and production is carried out by individual owners. Hybrid forms of governance may apply in-between the firm and market forms of governance, where types of variants between these two are needed. Transactions are defined by certain attributes that when paired with these corresponding generic forms of governance, hierarchy, hybrid, or market, result in optimal performance (Coase, 1937; Williamson, 1991). The following chapter will present TCE theory and explain governance and transaction characteristics. These are then applied throughout several case studies below.

CHAPTER 5

REVIEW OF LITERATURE AND TRANSACTION COST THEORY

TCE references the price mechanism, or law of supply and demand, so this will briefly be visited before moving further into TCE literatures. The price mechanism outlines the relationship between price and quantity for a buyer (demand) and a seller (supplier) in an exchange of goods or services (product). Both buyer and seller are self-interested parties that interact to reach an equilibrium price where the supply of a product is balanced with the demand for a product, leaving neither a surplus nor shortage in the market – satisfying each party relative to the conditions. The relationship between price and quantity is intrinsic to the interests of each party, with the seller willing to supply less at lower prices and the buyer willing to demand less at higher prices. This exchange is measurable for each party by their cost in the transaction compared to costs of other, competing or substitute opportunities. Rational decision-makers take the path of least resistance, or the best value. In addition, each side of the exchange is defined to some degree by the important variables that shift demand and supply.

R. H. Coase, one of the early visionaries of transaction cost economics (TCE) notes that resource allocation, coordination, or production is done without central control in a competitive economic system through the elastic, responsive, and automatic price mechanism; i.e. “through a series of exchange transactions on the market” (Coase, 1937). Alternatively, the firm, also referred to as hierarchy or organization, arises through the voluntary efforts of the entrepreneur-coordinator to substitute the price mechanism where optimally planned coordination would more efficiently allocate resources or production at less cost. The firm, a substitute within the larger economic system, “consists of the

systems of relationships which come into existence when the direction of resources is dependent on an entrepreneur" (Coase, 1937).

Within the larger economic system, resource scarcity will demand a reciprocal level of efficiency for which these two alternative forms of governance (coordination) participate, market and hierarchy (firm) each adapting to direct production that best fits within its unique range of efficacy. Analysis of costs and benefits relative to each of these discrete and alternative forms of governance facilitates the optimal alignment of transactions with the proper form of organization - coordination in the markets through price mechanism or direction within hierarchy. Whether production is carried out by market or hierarchy is explained by Coase (1937) this way:

> "The question always is, will it pay to bring an extra exchange transaction under the organizing authority? At the margin, the costs of organizing within the firm will be equal either to the costs of organizing in another firm or to the costs involved in leaving the transaction to be "organized" by the price mechanism. Businessmen will be constantly experimenting, controlling, and in this way, equilibrium will be maintained."

However, in order to select the best form of organization in which to conduct a specific transaction it is essential to understand the characteristics that define that transaction; the optimal alignment of a transaction with a fitting form of organization is the goal of TCE. As Williamson notes, "Transaction-cost economics subscribes to Commons' view that the transaction is the basic unit of analysis (Commons, 1924 and 1934)" (as cited in Williamson, 1991, p. 281). Williamson notes further that transaction as the basic unit of analysis, "takes on operational significance upon identifying the critical dimensions with respect to which transactions differ" and notes frequency, uncertainty, and asset specificity as three of these critical dimensions, with a greater

focus on asset specificity as the primary characteristics of any transaction (Williamson, 1991; Nickerson and Silverman, 2003).

Williamson then further identifies six types of asset-specificity that are important to recognize when pairing a transaction with a form of governance: "Site specificity, physical asset specificity, human-asset specificity, brand name capital, dedicated assets, and temporal specificity" (Williamson, 1991). Only a few of these are considered in the case studies below. Specificity is a trait that uniquely connects something to a certain subject. For example, a person that has credentials as an electrician will be preferred to perform an electrical installation over a person that has credentials to install roofing materials because the task has a high level of human-asset specificity – it requires a certain skill (electrician) to do the job. For similar reasons, no one wants a dermatologist to perform their dental work; or, their open-heart surgery. There is a high level of specificity in open-heart surgery – very few physicians possess this skill.

Another way to measure specificity is this, "The greater the difference between the value of an asset in its first-best and its next-best use, the more specific that asset is to the transaction (Klein, Crawford, and Alchian, 1978; Williamson, 1979)" (as quoted in Nickerson and Silverman, 2003, p. 434). Asset specificity changes outcome trajectory with respect to transaction characteristics. The painter will struggle to install the foundation of a house, for example. Williamson (1991) puts it this way:

> "Although asset specificity can take the variety of forms, the common consequence is this: a condition of bilateral dependency builds up as asset specificity deepens. The ideal transaction in law and economics – whereby the identities of buyer and sellers is irrelevant – obtains when asset specificity is zero. Identity matters as investments in transaction specific assets increase, since such specialized assets lose productive value when redeployed to best alternative uses and by best alternative users."

In other words, the lower the specificity, the more generic it becomes. It doesn't matter who does the work because it's so simple that anyone can successfully complete the task.

Table 2, which includes attributes of governance developed by Williamson, identifies the characteristics of transactions and forms of governance that have been discussed previously. Case studies later in this thesis refer to these three focal points.

Table 2.

Transaction Characteristics and Forms of Governance (Williamson, 1991)

Transaction Characteristics	Forms of Governance	Attributes of Governance
Uncertainty Frequency Asset Specificity: Site specificity, physical asset specificity, human-asset specificity, brand name capital, dedicated assets, and temporal specificity	Hierarchy Hybrid Market	Contract Law Adaptability Incentive Intensity Administrative Controls

Best costs are to be found in "discriminating alignments" of transaction qualities with their compatible forms of governance; the key to understanding discriminating alignments is explained by Williamson (1991) this way:

> "each viable form of governance – market, hybrid and hierarchy – is defined by a syndrome of attributes that bear a supporting relation to one another. Many hypothetical forms of organization never arise, or quickly die out, because they combine inconsistent features."

Optimal alignment prevails with a "discriminating alignment" of transaction characteristics with appropriate governance form; Williamson (1991) put it this way:

> "The discriminating alignment hypothesis to which transaction-cost economics owes much of its predictive content holds that transactions, which differ in their attributes, are aligned with governance structures, which differ in their costs and competencies, in a discriminating (mainly, transaction-cost-economizing) way."

Williamson (1991) proceeds to ask, with respect to governance structures, "what are the factors that are responsible for the aforementioned differential costs and competencies?" Governance forms, generically labeled as market, hybrid, and hierarchy, are defined by several focal factors, including contract law, differences in adaptability, and incentive and administrative control instruments (Williamson, 1991). Table 3 outlines dimensions of the governance forms and attributes developed by Williamson.

Table 3.

Governance forms and Corresponding Characteristics (Williamson, 1991)

Governance Forms	Attributes			
	Contract Law	Adaptation	Incentive Intensity	Administrative Controls
Market	Classic Contract	Adaptation (A)	Individual ownership	Between individuals
Hybrid	Neoclassic Contract	Adaptations (A) and (C)	Individual ownership/Fiat	
Hierarchy	Forbearance	Adaptation (C)	Fiat	Within company

Each form of governance and the associated characteristics, noted in Table 3, and listed in table 4, are addressed directly next in this thesis. The approach here is to look at each of the attributes within its corresponding form of governance, along with some examples and explanation. Later in this chapter, after governance forms and characteristics have been addressed, the characteristics of transactions are developed further. All concepts and principles in this section are taken from Williamson (1991).

Table 4.

List of Terms (Williamson, 1991)

Governance Form, Market:
Governance Form, Hybrid:
Governance Form, Hierarchy:
Governance Attribute, Contract Law:
Governance Attribute, Adaptation:
Governance Attribute, Incentive Intensity:
Governance Attribute, Administrative Controls:
Transaction Characteristic, Frequency:
Transaction Characteristic, Uncertainty:
Transaction Characteristic, Asset-specificity:

Market Governance Form:

Market, as noted previously, is a form of organizing or coordinating production in the larger economic system. Transactions are carried out in market by autonomous individuals, owners who regulate their business affairs based on the indicators of the price mechanism.

Market Governance Attribute, Contract Law: Market governance works on the principles of classic contract law, which protects market actors and structures relations. Williamson (1991) describes classic contract law this way, it "applies to the ideal transaction in law and economics – "sharp in by clear agreement; sharp out by clear performance (Macneil, 1974)" – in which the identity of the parties is irrelevant" (as cited in Williamson, 1991, p. 271). Here an irrelevant identity refers to the absence of types of dependencies, which we learn from Williamson (1991) is proportional to levels of uncertainty. In the focal industry, where complexity and uncertainty seem to be more or less present in a project-oriented environment, this ideal may at times be more difficult to reach. Participants become fewer and more specialized, and exchanges more customized.

Market Governance Attribute, Adaptation: In market, where adaptations are made in response to disturbances in prices, autonomous parties interpret market signals in the market mechanism and individually adjust. Williamson (1991) calls this autonomous adaptation, or "Adaptation (A)." Full ownership of all consequences here provides the incentive for individuals to make adaptations in ways that benefit both themselves and the overall economic system - the market mechanism was briefly addressed early in this chapter. Williamson (1991) notes, that here "consumers and producers respond independently to parametric price changes so as to maximize their utility and profits, respectively." In the project environment, where classic contract law is traditionally a significant force, means and methods are at the contractors discretion. However, more or less of the presence of uncertainty unavoidably alters the classical market dynamic.

Market Governance Attribute, Incentive Intensity: As just mentioned in the section on adaptation, full ownership of all consequences here provides a strong incentive intensity for individuals to perform. Full rights to all rewards create a strong incentive to perform strategically. Given the unique nature of the project-oriented environment with an increase in uncertainty, there may be an incentive to behave opportunistically. As Williamson (1991) notes, "From an economic point of view, the tradeoff that needs to be faced in excusing contract performance is between stronger incentives and reduced opportunism." As levels of uncertainty rise and market players become fewer and more specialized, and changes in the classic market dynamic of adaptation may introduce opportunism, this problem may be offset by a concern towards reputation among market participants. Williamson (1991) puts it this way:

"assume that it is possible to identify a community of traders in which reputation effects work better (or worse). Improved reputation effects attenuate incentives to behave opportunistically in interfirm trade – since the immediate gains from opportunism in a regime where reputation counts must be traded off against future costs."

Market Governance Attribute, Administrative Controls: There is no need for administrative controls in market governance. With independent parties and private ownership there is no need for an administrator to direct, regulate, or organize the parties of production.

Hierarchy Governance Form:

Hierarchy, as noted previously, is a form of organizing or coordinating production in the larger economic system where the efficacy of the coordinator-entrepreneur is optimal. Transactions are carried out in hierarchy, or firm, by employees, often in servant-and-master types of relationships as noted by Coase (1937).

Hierarchy Governance Attribute, Contract Law: The form of law that supports this type of governance is forbearance doctrine and the "business judgement rule (Gilson, 1986)" (as quoted in Williamson, 1991, p. 274). Outside of legal issues surrounding human rights, or crime, courts won't hear disputes from within companies, these must be settled within the company (Williamson, 1991). This provides hierarchy with fiat, or the authority to direct business as it sees fit to do so within the boundaries of the law and internal agreements. The institution in which this thesis is conducted is a hierarchical form of organization, with a very strong tier of management and chain-of-command. Like market, this attribute comes with pros and cons that are outlined in the next few paragraphs.

Hierarchy Governance Attribute, Adaptation: Adaptations in hierarchy occur in response to a need for greater coordination and cooperation, these are termed, "Adaptation (C)" by Williamson (1991). The need for "Adaptation C" typically accompanies greater specificity and its companion, bilateral dependency (Williamson, 1991). This is the "kind of cooperation among men that is conscious, deliberate, purposeful (Barnard, 1938)" and creates "convergent expectations" (as cited in Williamson, 1991, p. 278). This is a necessary characteristic of the firm, since individuals are not individually connected to the price mechanism and even if they were, they could each "operate at cross-purposes or otherwise sub optimize" (Williamson, 1991). Therefore, being able and willing to understand and follow instructions is a significant part of firm employment – and one with its own challenges.

Hierarchy Governance Attribute, Incentive Intensity: Unlike market, ownership here is subverted by fiat, authority or subordination, in a servant-and-master relationship. Therefore, incentive intensity is traditionally weak. The owner could pay Employee A and B comparatively the same amount whether they go the extra mile or not, thus flattening the incentive structure. Since employees don't technically possess ownership, they aren't likely to have a say in their compensation regardless of whether things go better or worse for the company. Nickerson and Zenger (2008) assert that a significant cost of the firm is this flat incentive structure and it's tendency to create "social comparison costs", "envy", "inequality and behavioral strategies" among employees.

Hierarchy Governance Attribute, Administrative Controls: Administrative controls are a strength of hierarchy, as it can, through fiat, organize coordination, control, and direct cooperation where there is a growing presence of asset specificity, uncertainty,

or forms of dependency that are cost prohibitive for market (Williamson, 1991). Williamson (1991) notes that the survival of a company, in uncertain environments, "depends upon the maintenance of an equilibrium of complex character….[This] calls for readjustment of processes internal to the organization…, [whence] the center of our interest is the process by which [adaptation] is accomplished (Barnard, 1938)" (as cited in Williamson, 1991, p. 278). However, this strength of hierarchy can also become a point of failure; Williamson (1991) notes that these adaptive advantages have costs, they can "degrade incentive intensity", and add "bureaucratic costs". Furthermore, Williamson (1991) notes that incentive intensity is simply an instrument that can be used as an administrative control, "If added incentive intensity gets in the way of bilateral adaptability, then weaker incentive intensity supported by added administrative controls (monitoring and career rewards and penalties) can be optimal."

There are other limits to the efficacy of hierarchy, diminishing returns of management, and "diseconomies of scope and sale" (Coase, 1937). Losses through mistakes of management, inefficiency, waste of resources, and failure to best use and align labor and resources with their highest value will increase as spatial distribution (different places) and dissimilarity (different kinds) of transactions increase – potentially making the transactions better suited for the market (Coase, 1937). The probability of shifts in supply or demand curves, may also increase the cost of organizing in the firm more than the market (Coase, 1937). Innovations and management techniques that counteract these limits will be needed to compete with market governance alignment (Coase, 1937). And, as mentioned, social comparison costs, envy, for example, also have a tremendous influence (Nickerson and Zenger, 2008).

Hybrid Governance Form:

Hybrid is a form of organizing or coordinating production in the larger economic system that utilizes features of market governance to address aspects of autonomy; and, features of hierarchy governance to address aspects of uncertainty and asset specificity present in an exchange. Transactions are carried out in hybrid organization by autonomous individuals, owners who regulate their business affairs based on the indicators of the price mechanism; but, also by greater focus on the contractual arrangement and relationship effects needed to deal with greater levels of specificity and uncertainty.

Hybrid Governance Attribute, Contract Law: Hybrid governance works on the principles of neoclassic contract law (Williamson, 1991). "Neoclassic contract law relieves parties from strict enforcement and applies to contracts where the parties to the transaction maintain autonomy but are bilaterally dependent to a nontrivial degree" (Williamson, 1991). Williamson presents this law as a "contract as framework":

> "highly adjustable, a framework which almost never accurately indicates real working relations, but which affords a rough indication around which such relations vary, an occasional guide in cases of doubt, and a norm of ultimate appeal when the relations cease in fact to work (Llewellyn, 1931)" (as cited in Williamson, 1991, p. 272).

This form of law is legally weaker than classic contract law, so contracts must address this by adding additional "contractual safeguards" (Williamson, 1991).

Hybrid Governance Attribute, Adaptation: Hybrid retains some autonomy, so adaptations are still type (A); however, there is also a need for greater cooperation, especially as disturbances or adversity intensity increases, so there will also be adaptations of type (C), noted more fully in the section about hierarchy governance.

Hybrid Governance Attribute, Incentive Intensity: With autonomy and ownership present here, the incentive intensity can still be strong. As was noted in the market incentive intensity section previously, given the unique nature of the project-oriented environment with an increase in uncertainty, there may be an incentive to behave opportunistically in this form of governance.

Hybrid Governance Attribute, Administrative Controls: Administrative controls are weak here, because autonomy is strong by virtue of the upholding basis of law. However, as Williamson notes, (1991) this doesn't preclude the parties from including "contractual safeguards", "administrative apparatus", "information disclosure", and "dispute settlement machinery" into the contracts. Relationship effects noted by Williamson (1991) can also play a role here.

See Figures 1 and 2, which characterize the strengths and weaknesses of these three forms of governance and their attributes as discussed above (Williamson, 1991).

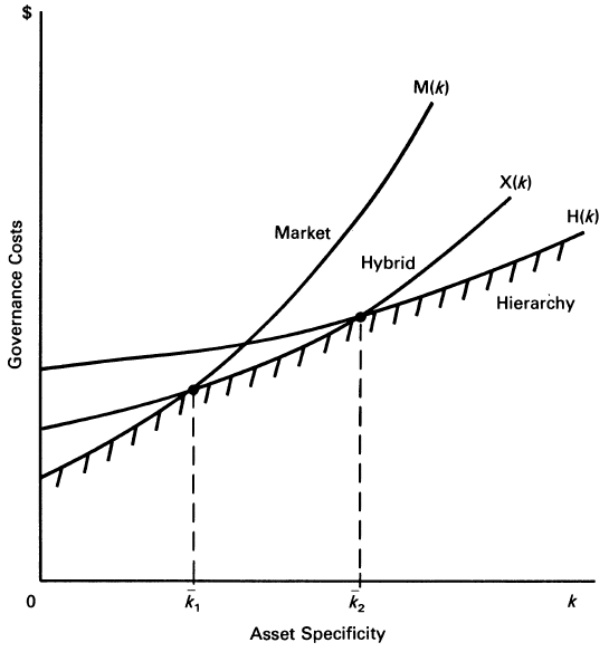

Figure 1. Governance Costs as a Function of Asset Specificity (Williamson, 1991).

Distinguishing Attributes of Market, Hybrid, and Hierarchy Governance Structures*

Attributes	Governance structure		
	Market	Hybrid	Hierarchy
Instruments			
Incentive intensity	++	+	0
Administrative controls	0	+	++
Performance attributes			
Adaptation (A)	++	+	0
Adaptation (C)	0	+	++
Contract law	++	+	0

* ++ = strong; + = semi-strong; 0 = weak.

Figure 2. Distinguishing Attributes of Governance Forms (Williamson, 1991).

With each form of governance and the corresponding attributes laid out above, it is now needful to discuss characteristics of transactions that determine outcome via alignment with these governance structures and attributes. Transaction characteristics of frequency, uncertainty, and asset specificity are laid out below.

Transaction Characteristic, Frequency:

Contract frequency, where a higher quantity and longer duration of contracts would increase uncertainty and the need for greater coordination and integration - drives long-term transactions into the firm. In addition, classical contract language can become burdensome in situations like this, and if contractual safeguards and dispute settlement language isn't included then autonomous parties may behave opportunistically, especially without the presence of bilateral dependency or in cases of increasing adversity (Williamson, 1991).

Transaction Characteristic, Uncertainty:

Uncertainty seems to favor the firm, transactions that include elevated uncertainty add costs to the market. Coase (1937) observes that,

> "With...uncertainty – the fact of ignorance and the necessity of acting upon opinion rather than knowledge – …the actual execution of activity, becomes in a real sense a secondary part of life; the primary problem or function is deciding what to do and how to do it (Knight, 1933)" (as cited in Coase, 1937, p. 399).

Uncertainty also increases risk where information such as relevant prices are yet to be discovered, even if there are specialists selling that information (Coase, 1937). Likewise, Figure 3, demonstrates a heightened level of uncertainty by illustrating differences between high and low bid, project cost and project estimate, and project cost and low bid, within 24 low bid/fixed cost projects in the focal institution.

Transaction Characteristic, Asset-specificity:

Asset specificity, defined earlier in this theory chapter as unique or specialized equipment or human skills that have a narrow application, typically increase the costs of market governance and better align with the hierarchical form of governance, where greater cooperation can address the needs it introduces. Asset specificity tends to increase labor costs, specifically with a higher degree of human-asset specificity, special knowledge and skills, adding costs to the market.

In addition, uncertainty and adversity may increase the need for greater levels of coordination and cooperation, both more manageable in the firm. Where uncertainty, frequency, and specificity are high, the firm, or organization, is better suited to induce the needed cooperation and coordination (Williamson, 1991).

CHAPTER 6

THESIS METHODOLOGY

In summary of the foregoing, market and hierarchy governance are two discrete forms of governance that best accommodate discrete types of transactions. Transactions are most efficient when the corresponding type of governance structure is identified and applied (Williamson, 1991). Given that transactions in the construction and facility industry are typically heterogenous, correctly identifying the right approach, or governance structure or structures for each depends on the transaction characteristics aggregated in the transaction. With the review of governance forms, governance attributes, and transaction characteristics in chapter 5, it is time to move into case study applications.

In what follows, four cases from the industry are presented where governance and transaction alignments created dissonance. In each case study, misalignments are demonstrated using TCE to analyze the characteristics of the transaction and governance structure. These cases all have one commonality: decisions by the firm are made based on a principle of hierarchy, fiat, even when the characteristics of the transaction suggest a different governing structure. The result? In each case outcome quality was poor and owners spent more than they intended for the outcome. It is cases like these that led one disillusioned field manager to quip, “why pay only once when you can pay twice?”

A fifth case study applies TCE principles to the production process of five small projects to assess compatibility of the theory with the industry. The outcome of these five projects is compared against the outcome of either a comparable project or other defensible figure for projects that were done without TCE alignments.

Production Procurement Method	Bids	Project Estimate	Project Grand Total	Min Bid	Sum of Total Paid to AEC	Difference between High and Low Bid	% Difference, High and Low Bid	Difference, Project Cost Less Estimate	Difference, Project Cost Less AEC Less Low Bid	% Difference, Project Cost Less AEC Less Low Bid
Low Bid/Fixed Price	5	$ 235,059.00	$ 286,697.17	$ 267,374.00	$ 19,874.00	$ 119,074.00	45%	$ 51,638.17	$ (550.83)	0%
Low Bid/Fixed Price	3	$ 83,305.00	$ 65,009.92	$ 55,911.00	$ 8,405.00	$ 26,174.00	47%	$ (18,295.08)	$ 693.92	1%
Low Bid/Fixed Price	7	$ 1,725,444.00	$ 1,685,104.94	$ 1,391,400.00	$ 159,369.50	$ 508,000.00	37%	$ (40,339.06)	$ 134,335.44	8%
Low Bid/Fixed Price	4	$ 879,765.00	$ 1,175,555.02	$ 879,900.00	$ 108,520.00	$ 206,600.00	23%	$ 295,790.02	$ 187,135.02	16%
Low Bid/Fixed Price	7	$ 842,162.00	$ 653,616.26	$ 557,000.00	$ 35,207.50	$ 237,000.00	43%	$ (188,545.74)	$ 33,422.22	5%
Low Bid/Fixed Price	2	$ 5,000.00	$ 1,960.35	$ 1,960.35	$ -	$ 1,239.65	63%	$ (3,039.65)	$ -	0%
Low Bid/Fixed Price	6	$ 192,000.00	$ 173,345.74	$ 161,365.00	$ 12,374.00	$ 31,335.00	19%	$ (18,654.26)	$ (393.26)	0%
Low Bid/Fixed Price	2	$ 14,400.00	$ 7,671.00	$ 14,342.00	$ -	$ 1,183.00	8%	$ (6,729.00)	$ (6,671.00)	-87%
Low Bid/Fixed Price	2	$ 41,685.00	$ 38,312.50	$ 36,000.00	$ 2,312.50	$ 1,187.00	3%	$ (3,372.50)	$ -	0%
Low Bid/Fixed Price	3	$ 10,694.00	$ 12,674.00	$ 11,980.00	$ -	$ 9,420.00	79%	$ 1,980.00	$ 694.00	5%
Low Bid/Fixed Price	5	$ 367,250.00	$ 296,177.74	$ 263,300.00	$ 25,225.00	$ 118,700.00	45%	$ (71,072.26)	$ 7,652.74	3%
Low Bid/Fixed Price	6	$ 228,437.00	$ 336,262.83	$ 277,800.00	$ 44,752.23	$ 135,200.00	49%	$ 107,825.83	$ 13,710.60	4%
Low Bid/Fixed Price	6	$ 454,425.00	$ 469,558.14	$ 399,000.00	$ 35,473.75	$ 92,300.00	23%	$ 15,133.14	$ 35,084.39	7%
Low Bid/Fixed Price	4	$ 45,000.00	$ 35,077.76	$ 36,300.00	$ -	$ 8,600.00	24%	$ (9,922.24)	$ (1,222.24)	-3%
Low Bid/Fixed Price	4	$ 104,879.00	$ 100,027.52	$ 104,000.00	$ -	$ 32,659.00	31%	$ (4,851.48)	$ (3,972.48)	-4%
Low Bid/Fixed Price	3	$ 51,992.00	$ 41,980.87	$ 13,200.00	$ 2,575.00	$ 82,300.00	623%	$ (10,011.13)	$ 26,205.87	62%
Low Bid/Fixed Price	6	$ 114,882.00	$ 102,964.10	$ 94,900.00	$ 9,500.00	$ 144,600.00	152%	$ (11,917.90)	$ 8,064.10	8%
Low Bid/Fixed Price	4	$ 19,200.00	$ 18,150.00	$ 15,150.00	$ 3,000.00	$ 21,770.00	144%	$ (1,050.00)	$ -	0%
Low Bid/Fixed Price	3	$ 46,550.00	$ 35,256.00	$ 25,056.00	$ 10,200.00	$ 8,093.00	32%	$ (11,294.00)	$ -	0%
Low Bid/Fixed Price	2	$ 80,004.00	$ 59,171.80	$ 45,800.00	$ 12,100.00	$ 26,154.00	57%	$ (20,832.20)	$ 1,271.80	2%
Low Bid/Fixed Price	2	$ 15,950.00	$ 19,500.00	$ 19,500.00	$ -	$ 7,250.00	37%	$ 3,550.00	$ -	0%
Low Bid/Fixed Price	2	$ 44,687.00	$ 58,853.70	$ 62,168.00	$ 7,685.70	$ 25,832.00	42%	$ 14,166.70	$ (11,000.00)	-19%
Low Bid/Fixed Price	2	$ 96,184.00	$ 64,737.31	$ 64,315.00	$ 8,192.51	$ 31,315.00	49%	$ (31,446.69)	$ (7,770.20)	-12%
Low Bid/Fixed Price	2	$ 15,492.59	$ 26,737.00	$ 23,737.00	$ 3,000.00	$ 438.00	2%	$ 11,244.41	$ -	0%
TOTAL			**$ 5,764,401.67**						**$ 416,690.09**	7%

Figure 3. Uncertainty in Project Work with Low Bid/Fixed Price Paradigm

CHAPTER 7

CASE STUDIES

Case Study 1: External and Internal Relations, Contracted Project Procurement and Management Barriers.

The purpose of this case study is to identify operational inefficiency caused by a particular type of governance-transaction misalignment common in the industry and use TCE to explain the problem. It also uses TCE to suggest a solution, and then briefly recounts how and why this solution did not happen due to larger firm governance issues. All the case studies follow this same format.

Case Study 1, General Industry Problem:

Procurements are often inefficient with cost overruns, less than specified quality, and low customer satisfaction. This is an issue that is both generally recognized and clearly unacceptable but continues to occur.

Case Study 1:

A coal fired boiler was to be replaced in a remote area with a propane fired boiler, making it necessary to move the boiler out of the basement of the building into added space adjacent to the building. The controls and other parts of the boiler system were also to be replaced at this time. Bid documents were prepared with designs and specifications provided from professional architectural and mechanical engineer consultants, along with specifications from in-house engineers. The project was procured through the owners' pre-selection, low-bid, fixed-cost procurement paradigm.

The project started in August 2014 and concluded in May 2016, a schedule 15 months longer than contracted. The adjacent space for the boiler was constructed and the

boiler placed inside without incident. However, when it came time to operate the boiler, it wouldn't stay lit because it hadn't been correctly assembled: the controls were installed incorrectly, and other miscellaneous parts of the system were installed incorrectly. A separate boiler contractor and a controls contractor who had proven expertise were hired to identify and correct the errant installation and make the system functional.

The project was significantly over budget, having been estimated to cost $243,000, bid at $399,000, and cost $468,000. The owner accepted the less than contracted quality and released the original contractor from his contractual obligations, paying full contracted price, including change order costs – with the conclusion that litigation would have cost more than the value that could have been recovered. Problems due to the installation resulted in continued boiler performance issues for the following three years of operation.

Case Study 1, Diagnosis: Observed Areas of Concern.

1. The owner (buyer) aggregated a complex, heterogenous scope of work that included additional space, a boiler installation, and an idiosyncratic controls system, into a single transaction and then put it out to selected pre-qualified vendors for a low bid.
2. The vendor's qualification, specialization, experience, expertise, and capability were only a partial fit for the transaction. While the additional space went up without incident, the controls system was far beyond the vendor's expertise; and, the boiler system components, relative to the vendor's expertise, created a significant degree of specificity (partial knowledge or capability). The vendor was the lowest price, agreed they could fulfill the obligations of the contract and

had the requested capability, and entered into the contractual agreement with the owner.

3. The selected vendors had worked previously with, and had an autonomous, non-dependent relationship within the owner's organization and knew that performance is typically not enforced. This relationship, and weak enforcement reputation, may have fostered opportunistic behavior. The vendor was hired for another job with the same owner not long after this failed project.
4. In-house management focused on following a prescribed low-bid process to cooperate with the institutional bureaucracy while ignoring TCE principles in the salient transaction characteristics and governance attributes.

Case Study 1, Discussion:

The project transaction was aggregated in ways not aligned with specialties, experience, expertise, or capability of the vendor market. This created a form of talent specificity by the steep and extensive learning curve for the controls system installation and some of the boiler system components, a degree of specificity that TCE suggests should be carried out by a coordinated effort within the firm rather than by contract. In this case the firm would be unwise to integrate this function since there are experts that can perform these functions, and hiring and training a crew for this job alone would be cost prohibitive. While procuring the project the owner could have either made a separate contract with the controls expert or identified a general contractor with the expertise of working with such an expert.

With uncertainty high, the use of a low-bid procurement method – based on price, to the exclusion of other more salient transaction characteristics – was mismatched to a

simple form of contract governance that typically accompanies a greater level of enforcement in this environment. When this mismatch occurs, it typically results in elevated risk, and thus increased rates of failure, including dispute management problems. Absent bilateral dependency between the parties, in addition to poor enforcement reputation, the vendor had string incentive to act opportunistically, cutting corners in self-interest. Also, of interest in this case study is the presence of a third-party vendor, a subcontractor, selected by the vendor, who didn't possess the needed skills.

Case Study 1, TCE-Based Solution: A Test.

A TCE based solution would potentially consider all possible characteristics of the transaction and match them with the best fitting governance structures, disaggregating where inconsistent features are grouped, minimizing relative specificity through matching vendor qualifications, and thus reducing uncertainty, dispute, enforcement, and opportunistic costs (Williamson, 1991; Coase 1937). To test the efficacy of this solution the following process was proposed to the firm:

1. Randomly select 20 similar projects, use 10 as the test and 10 as the control group. Ten projects will be awarded on the traditional low-bid procurement method while the other 10 are awarded to contractors selected according to TCE prescriptions.
    a. Hypothesis: Projects aligned with TCE prescriptions will be more efficient and yield greater customer satisfaction.
    b. Null Hypothesis: There will be no difference between TCE alignment and the traditional low-bid method in terms of money saved and the quality of the outcome.

Test Results:

A list of potential projects was generated using owner's data. Permission to test the hypothesis was requested at multiple levels as outlined below:

a. Request sent to professional client level staff, directing engineers and architects.
    i. Rejected request; not interested, too difficult to make exceptions for this.
b. Requested of the director of the purchasing department.
    ii. Rejected request: not interested.
c. Requested approval to run analysis as part of this thesis was sent to the director of the facilities department.
    iii. Request was redirected to headquarters team-leader for experimental projects.
    iv. Rejected request: directed to send request through direct chain of command.
d. Sent this test proposal through the traditional chain of command, using their format, see Figure 4.
    v. The request was presented fall of 2017, and then again in January of 2018 to the regional and area physical facilities managers. Requested projects at three levels of funding.
        1. $20,000 to $30,000
        2. $50,000 to $100,000
        3. Over $90,000

vi. Request rejected: projects and permissions were “too difficult” to obtain. Directed to try working with peer managers on low dollar projects under $30,000, where field management has more discretion.

e. Requested projects between $20,000 and $30,000 from peer facilities managers.

vii. Very few options, not enough for random sample test and control groupings.

viii. Peers were not interested in participating, it made matters more complicated for them, and inconvenience became their concern.

In the end, projects were not made available to test the hypothesis. In each scenario above, management explicitly noted that it would be very difficult to get permission from upper management to run this experiment, except for projects under $30,000 where field management has some discretion within procedural boundaries.

Case Study 1, Conclusion:

In case study 1 we found a high degree of uncertainty and specificity created when the owner hired a vendor to perform work that was outside of their capability – resulting in failure. Adaptation issues became apparent when the firm was approached with alternative project management methods and was unable to allow significant tests. Even with a significant failure the firm wasn’t motivated to change the paradigm. Future research could explore causes of barriers between levels of management, and firm adaptation difficulties. Relationship dynamics of a third-party vendor may also be important to consider.

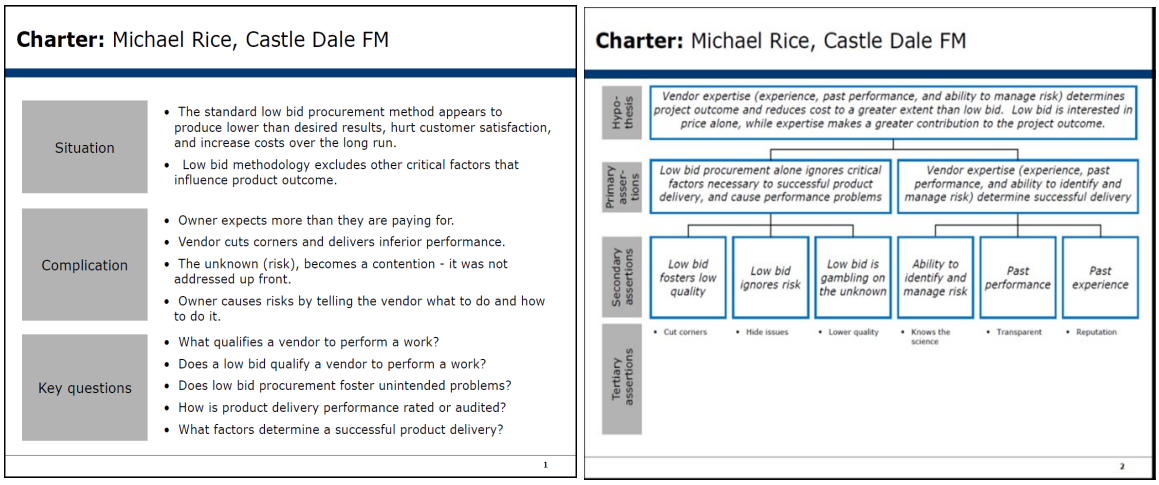

Figure 4. Proposal for Alternative Project Procurement

Case Study 2: External Relations, Contracted Services Procurement.

Case 2, General Industry Problem:

Project transactions that are aggregated by the firm often don't align with vendor specialties, experience, expertise, and capability and create situations of relative specificity or uncertainty, increasing transaction costs. Governance structures' inconsistency with transactions characteristics introduce additional challenges.

Case Study 2:

Mid-season, after local contractors had been performing to expectations for at least two months for a large, multi-regional organization, the organization's management implemented a "landscape-category-management, outcome-based" groundskeeping services contract across the region. The owner prepared the contract and scope, issued a request for proposal (RFP) to vendors they had prequalified, sketched out three geographical boundaries across 13 field management areas, and then selected one vendor for each area based on the most reasonable proposal – excluding some proposals that looked "too low". Field managers were directed to terminate existing contracts so

management could implement the new contract. The new paradigm boasted two major points: First, it claimed existing contracts were too prescriptive and drove up costs by telling the expert how to do the job; so, by removing prescriptive language the expert could perform to a generalized "green and clean" outcome, rather than performing to unnecessary dictations. This would streamline the process for the expert. Second, economies of scale could obtain and thus decrease costs by increasing the quantity of work per vendor. In a written letter to the field managers and customers, the director guaranteed the unusual concept would provide the same or better quality while significantly reducing costs.

To the contrary, the remainder of that first year and following three years proved to be disastrous for groundskeeping. Quality severely decreased, customer satisfaction reached a record low, and contract enforcement costs were exacerbated. Other vendors were hired at times to address performance issues that the contracted vendor was not fulfilling. The owner accepted the less than contracted quality and paid the full contracted amount, justifying their "experts" performance issues as a "learning curve" – defying the very definition of "expert". Then, for the last year of the contract the owner increased the contract amount by 18% to motivate the contractor to perform. Much to the consternation of the owner there was no significant improvement to the performance of the contractor. Poor performance proved to be inevitable for this disastrous agreement.

Case 2, Diagnosis: Observed Areas of Concern.

1. The owner/buyer aggregated a complex, heterogenous scope of work. In this instance, this included lawn maintenance such as mowing, edging, and clean-up; lawn treatments such as herbicide and fertilizer application; irrigation system

maintenance such as valve and solenoid, head, and line repair, as well as irrigation clock schedules and adjustments; and, shrub bed maintenance such as weed and trash removal, as well as shrub and tree trimming. All were aggregated into a single transaction, with a single dollar figure per this aggregated transaction, and then awarded to the selected vendor.

2. The vendor selected for the contract was only partially qualified for the scope of work, and hired multiple smaller third-party vendor start-ups who had no previous experience with groundskeeping business to perform much of the work. Trimming, mowing, and clean-up aren't too difficult to learn, but the irrigation system maintenance and lawn treatments, relative to the vendors' expertise, created an extremely high degree of specificity (no knowledge or capability).
3. The relationship between owner and vendor was absent any form of bilateral dependency; the identity of either group did not bind them to the transaction (Williamson, 1991). Either party could terminate the exchange without significant loss. The owner could easily find a new groundskeeper and the vendor could easily find a new customer.
4. The "outcome-based" contract is a neoclassic contract, very informal and very vague, without any dispute management and enforcement machinery, so that when coupled with uncertainty and a weak dependency relationship, opportunistic behaviors occurred (Williamson, 1991).

Case Study 2, Discussion:

The project transaction was aggregated in ways not aligned with specialties, experience, expertise, or capability of the vendor. While the vague contract language was

intended to give the vendor liberty to deliver based on expertise, the vendor was not expert in all areas of the heterogenous contract, thus increasing the specificity and uncertainty relative to the vendors capability. These transaction characteristics were mismatched with a hybrid form of governance that typically accompanies a significant level of enforcement and dispute management. However, absent bilateral dependency between the parties, and considering poor enforcement and dispute management machinery, the vendor was motivated to act opportunistically, cutting corners and neglecting contractual obligations (Williamson, 1991).

Case Study 2, TCE-Based Solution:

There won't be a new TCE-based solution to introduce to the organization for this case study. The same principles from case study 1 TCE-based solution apply here. These include selecting the vendor based on qualifications to perform all aspects of the heterogenous transaction, utilizing correctly drawn contracts that address the characteristics of the transaction and bring governance in line with these concerns, and arranging for coordination and cooperation where specificity is high.

Case Study 2, Conclusion:

Two points the firm boasted as revolutionary advancements were central weaknesses of the procurement. First, the owner dictated the boundary and thus the scale of the work, rather than letting the boundary align with the capability of the specialists; and, second, the owner dictated the contract and thus the scope of the work, aggregating heterogenous transactions rather than aligning them to the specialization, experience, expertise, and capability of the vendor. Transaction characteristics were not aligned with

compatible governance forms, yielding far less than optimal functionality (Williamson, 1991).

Case Study 3: Internal Relations, Measurement and Conformity Management

Case Study 3, General Industry Problem:

To incentivize desired behavior, regular audits measure performance based on how well personnel conform to policy and process. Audits examine whether a budget was produced, and how funds were spent, work was completed, and expenses were coded as per policy and process. Thus, in this system, management uses this information to measure whether funds were misappropriated, not whether they were inefficiently spent. Success in this formality is defined by procedural conformity, regardless of the economic outcome. The firm dictates budget and project preparation, classification, process, and policy without providing efficiency-management and measurement tools.

Case Study 3:

Availability of comparative finance data for budget and project planning, forecasting, and efficiency-management is extremely limited and difficult to use in the focal firm, which happens to be located on the far end of the governance spectrum at the point of subordination, a master/servant relationship. Financial data for comparison across Facilities Management groups, by accounting code, over any period, has hitherto been nonexistent. This inhibits efforts in the field to increase efficiency of funds spent.

Case Study 3, Diagnosis:

Characteristics of the firm are key here. The hierarchical governance style of the firm leads it to employ a flat incentive structure, which keeps motivation flat as well (Nickerson and Zenger, 2008). Field management shares little if any ownership in the

processes of the firm, and performance efficiency measurement apparatuses are entirely absent. Incentives for such apparatuses are naturally present when autonomy and decentralization are the paradigm. In the hierarchical governance structure within this firm, autonomy, market-like incentives, and ownership would likely cause a conflict between control and efficiency (Nickerson and Zenger, 2008).

While a virtue of hierarchy is that anyone can be induced to follow the rules without having to think too much or know too much, the downside is that motivation to measure efficiency is low.

Case Study 3, Discussion:

This may be a tradeoff problem: efficiency measurement machinery could empower the field manager, while creating central control problems for a firm based on hierarchy; to favor one is to disfavor the other. Social comparison as noted by Nickerson and Zenger (2008) could then potentially become an issue if a firm were to install efficiency measurement devices, particularly where incentives are flat. Personnel may question, "Why am I being paid the same or less than him or her when I am more efficient and save the company more money?" Social comparison brings social comparison costs to the firm: envy, with several costly manifestations; these tradeoffs and problems do *not* arise under a market-style governance structure (Nickerson and Zenger, 2008). If the firm has no intention to decentralize, shift autonomy to the field, and apply market-like incentives - the tradeoff is efficiency or control. Thus, given the chosen governance style, the firm is left to dictate means and methods without discussing performance management, and efficiency suffers as a result. Alignment of specialization, experience, expertise, or capability with the task is not only considered unnecessary, but

problematic to the control paradigm of the hierarchical governance style. Thus, while work tasks may be organized, they are not economized.

Case Study 3, TCE-Based Solution:

If the firm desires greater efficiency, a potential solution would be to adopt the type of optimal functionality paradigm described by Nickerson and Zenger (2002), where formal hierarchical governance structure is complimented by an informal governance structure that allows for greater autonomy within certain bounds. A similar approach was attempted in case study two, but other problems with the attempt led to a poor outcome. When done with TCE alignment principles in mind, however, it has been shown to reduce costs significantly – regardless of the formal governance structure of the firm.

One way to do this would be to put an information system in place that provides information to field managers that clearly reveals inefficient performance in a way that would prompt efficient deviation from the formal conformity paradigm at the top of the firm. The researcher proposed such a test, as follows:

1. The researcher developed a tool in Microsoft Excel that enables field managers to utilize a collection of both historical financial planning and expense data to judge his or her performance efficiency.
    a. Hypothesis: Performance information will prompt field management efficiency alignments.
    b. Null Hypothesis: There will be no difference between behavior in the presence or absence of this information.
2. The researcher shared this tool, informally, with other FM groups in the region. The tool made it possible to compare and contrast data across FM groups by year

and accounting category and code. Metrics were available in both dollars and cost-per-square-foot. The tool graphically showed trends, compared performance against similar FM groups, and revealed areas for improving efficiency. For examples of the vast data made available to field managers, see Figures 5, 6, and 7 which show data from the interface and display of the tool. As can be seen, the tool provided the specific ability to compare planning and spending behavior over time and across areas. As an unintended consequence, it also provided a medium for upper management to micro-analyze and micro-manage the managers. Regional management showed great interest in this tool at first, because it opened a window for them to view spending behavior, and it was quickly adopted by the focal region and then spread to a neighboring region.

The tool was utilized for the 2017, 2018, and 2019 planning cycles and then was discontinued without comment. This research sent an email to the regional manager to ask for his opinion and request permission to survey the region about what they liked and didn't like about the tool, but the email was dismissed, and permission was not granted.

The approach correlated with TCE and field management experienced an increase in efficiency during its use. However, its discontinuance suggests that the central hierarchy might have been aware of the tradeoffs and problems that arise with efficiency comparisons within a firm that does not intend to adopt a more market-based style of compensation.

Case Study 3, Conclusion:

While with formal governance the master/servant relationship in this institution favors obedience over efficiency and the firm believes that an acceptable outcome is

induced through process and policy, it is suggested here that the inertia of informal governance may be altered through the presence of efficiency aligned information (Nickerson and Zenger, 2002). The goal is to locate the performance of informal governance between centralization and decentralization, where most heterogenous transaction occurs, to utilize benefits of both forms of governance. Adaptation of formal governance structure in this institution is not likely to happen, but personnel can act efficiently if allowed to do so. However, any fear mongering or other authoritarian threats to personnel for deviation would damage this effort.

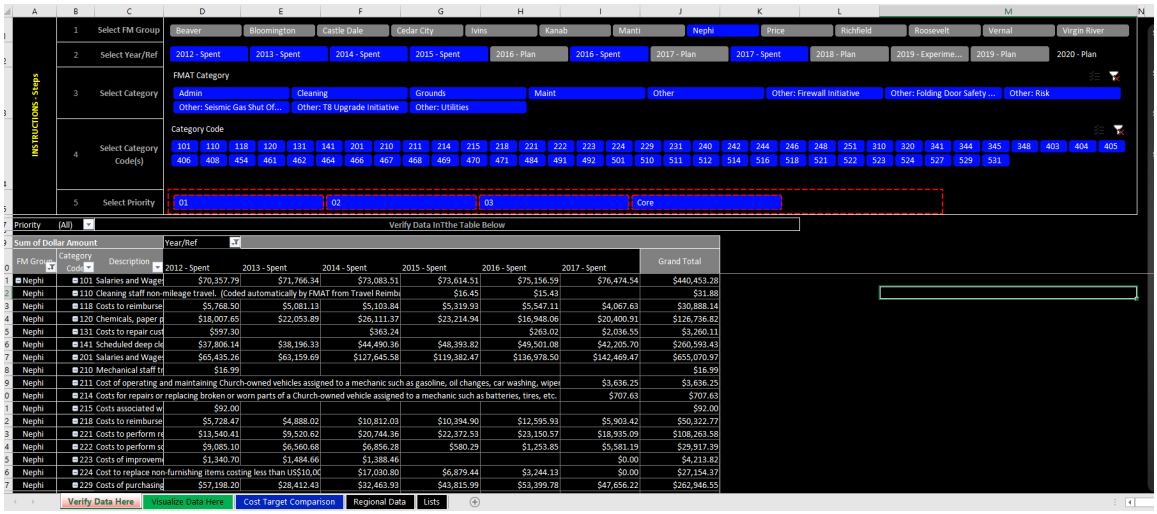

Figure 5. Analytical Tool Data Verification

Figure 6. Analytical Tool Comparison Across Codes

Figure 7. Analytical Tool Comparison Across Categories

Case Study 4: Internal Relations, Budget Planning and Preparation

Case Study 4, General Industry Problem:

Data employed in the previous case study revealed that field managers typically request more funding than needed in annual operations and maintenance budgets, resulting in misallocated funds and opportunity costs to the firm. Budgets are prepared as directed by upper management to an extensive level of detail; each detail introduces an increased risk of misallocating funds or padding each number to some extent.

Case Study 4:

The focal firm dictates zero based budget production by accounting code. This process aggregates collection of all data from each field manager under one code or another and neglects the fact that each type of project needs a unique approach. Some codes are better planned for on a macro scale at a higher administrative level where information is more readily available and takes on greater accuracy and some are better planned on the micro level. In this case, field managers don't possess the resources or expertise to budget accurately for some of the codes. Uncertainty and fear of retribution leads field management to "pad" their budgets. For instance, a comparison of funds requested to funds spent in 2017 shows that region X requested $466,146 more than it spent for a "Core" set of accounting codes, see Figure 8. There are approximately 41 regions in the United States. If each region requested like region X, it would misallocate $19,112,006 dollars annually, tying up scarce resources that could be used by the firm for other projects. The percentage of the total annual budget this accounts for is unknown.

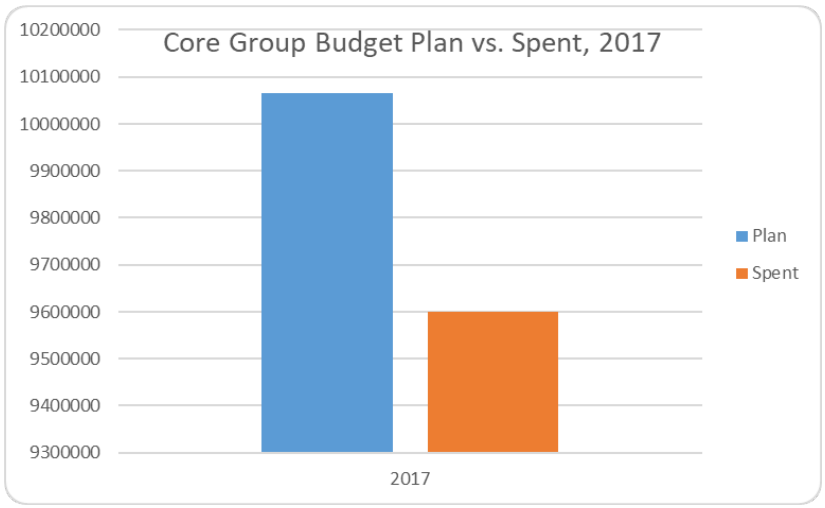

Figure 8. Dollars Requested vs. Dollars Spent for Core Category in 2017

Case Study 4, Diagnosis:

1. The firm, acting authoritatively, dictates the format for budget planning, while neglecting field management expertise and limitations. Inducing field personnel to do something they aren't capable of doing increases the specificity of the task.
2. Increased specificity demands increased cooperation and coordination, where upper management should step in and assist with the task. This isn't happening, so the firm experiences a greater degree of inefficiency in allocating its funds.

Case Study 4, Discussion:

Analysis of historic expenses by accounting code for the last five years shows that a "Core" group of accounting codes is predictably consistent and composes between 50% to 57% of expenses each year over five years, see Figure 9. These codes, if planned for at a higher level, could reduce risk of "padded" budgets.

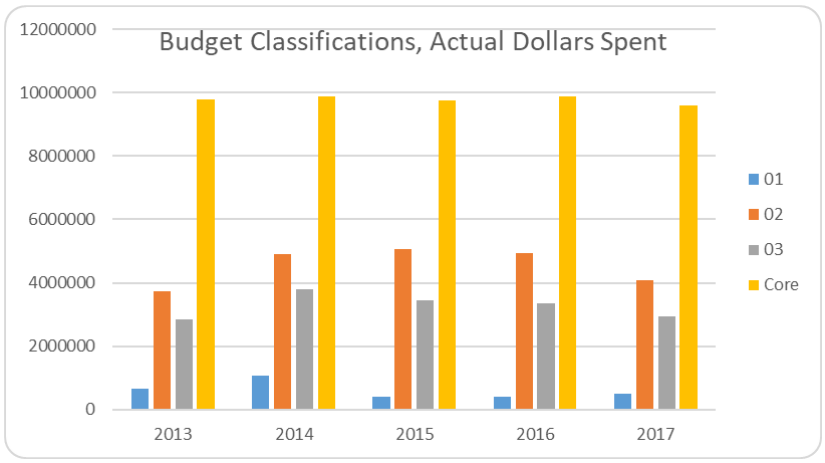

Figure 9. Dollars Spent, 2013 Through 2017, by Classification

Case Study 4, TCE-Based Solution:

Using the basic principles of TCE, the author proposed to disaggregate the budget process and plan for individual codes at the level they are best addressed: the field manager planning those codes that best align with transactions that are best known in the field, and administration forecasting core costs with greater accuracy on a larger scale. Utilizing historical finance data, a set of core costs were identified, by accounting code, which illustrates a predictable corpus of spending per year over the last five years. An example budget forecast was prepared with a dollar amount for each accounting code in the core set for the 2019 budget cycle for each of the 12 field management groups in the region. The purpose of this effort was to determine if a budget can be predicted for a specific set of codes at a macro level with greater accuracy than a budget that is predicted for the same set of codes in greater detail at the micro level.

a. Hypothesis: Budget planning for predictable costs on a broader scale (macro) will reduce risk of overbudgeting, whereas micro budgeting accentuates overbudgeting.

b. Null Hypothesis: There will be no difference between these budget methods.

The concept of creating categories of predictability in the accounting code schedule is not, and hasn't been, utilized in the budgeting process of this institution generally. So, the researcher gathered these data and developed and introduced this idea during February 2018 (for the 2019 planning cycle) to a group of field managers at a regional meeting. See Figure 12 for a side by side comparison of the traditional approach vs. the modified accounting code approach suggested at this meeting. During the meeting the following were completed by the researcher:

a. Presented the new data and the proposed budget to the other Field Managers
b. Presented data and proposed budget to the Regional Manager
c. Surveyed Facilities Managers for their response to the questions listed in Figure 10. The questions presented in Figure 10 are exactly as they were presented to the respondents. After presenting the modified accounting code schedules to these managers, the author sent survey to them to capture their perception about the adequacy of the material presented, the adaptability of the institution, and their own adaptability. All survey responses were done in anonymity. All yes responses were positive feedback and all no answers were negative feedback.

Question #	Context	Question Text	Respndent 1	Respndent 2	Respndent 3	Respndent 4	Respndent 5	Respndent 6	Respndent 7	Respndent 8	Respndent 9	Respndent 10	Respndent 11	Respndent 12
1	Material	Presentation – Was the material presented in an understandable and convincing way? (could an FM understand what was being proposed?)	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	Material	Timeliness – Was the method provided in enough time that it could have been implemented (at our level) for the current budgeting cycle?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
3	Institution	Institutional compatibility – Was the working environment conducive to shifting over to this way of budgeting? (Would the current planning process allow for it?)	Yes	No	No	No	No	No	Yes (	No	No	Yes	No	Yes
4	Material	Material – Was the format of the material clear, understandable, and usable? (could an FM have actually used the proposed 2019 core budget amounts if our current planning process had allowed it?)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
5	Institution	Institutional adaptability – Do you think the institution would have accommodated a change to process to allow this planning method if we had insisted?	Yes	No	No	No	No	Yes	No	Yes	No	No	No	Yes
6	Personnel	Personal adaptability – Would you, personally, have used the 2019 core budget amounts if the current planning process had allowed it?	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Figure 10. Questions of Follow-up Survey to Test II Presentation

As the new approach could not be adopted without approval from the central hierarchy, and this was deemed unlikely, the survey simply captured sentiments from participants about how helpful the new approach might be to them if used, and whether they would adopt it. Figure 11 presents the results in graph from. There were 12 participants in total who completed the survey. All respondents had been employed for at least five years, and the majority for over 10 years, at the time of this survey. On the graph, the circle at each point contains the number of responses, out of 12, to provide yes and no answers to each question.

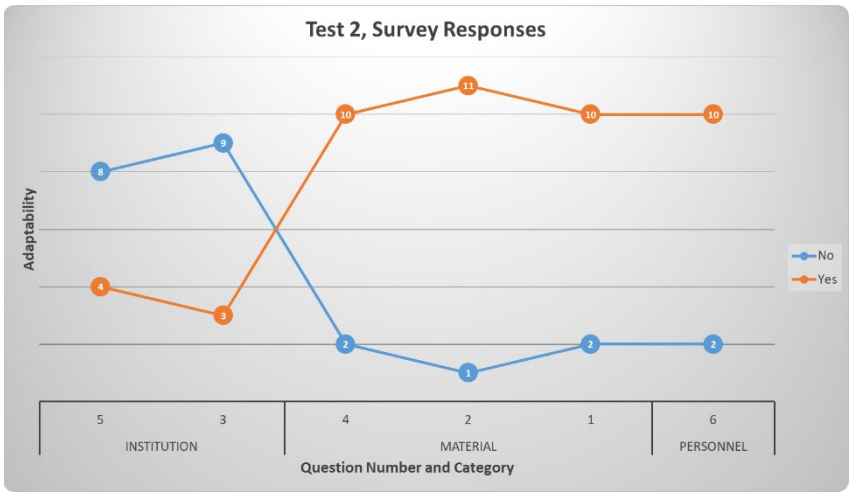

Figure 11. Perception of Institutional Adaptability, Test II

Survey results indicated that most personnel believed the material was timely, presented to their understanding, and could be implemented if the institution allowed it. The majority indicated they possessed the adaptability necessary to make the change. On the other hand, the majority indicated their belief that institutional norms would not allow this to happen. The regional manager supported the idea but wasn't ready to support it through the institution for broader adoption. The effort was discontinued, and the test was not completed.

Case Study 4, Conclusion:

Costs in the "core" set of accounting codes are predictable, most accurate at a high level, and constitute over half the annual budget. Yet, field managers are directed to produce a micro-level forecast every year and typically over-budget in fear of potential shortfalls. This phenomenon demonstrates a weakness of hierarchy. Unlike previous cases where the firm dictated processes that TCE suggests should have been left to the expert, in this case a transaction that best fits a higher level of coordination and

technology was left to the field managers. Both types of mismatches, and their attendant inefficiencies, could be avoided by applying TCE.

Priority Level	Category	FMAT Category Code
Core	Cleaning	101
Core	Cleaning	110
Core	Cleaning	111
Core	Cleaning	114
Core	Cleaning	115
Core	Cleaning	118
Core	Maintenance and Repair	201
Core	Maintenance and Repair	210
Core	Maintenance and Repair	211
Core	Maintenance and Repair	214
Core	Maintenance and Repair	215
Core	Maintenance and Repair	218
Core	Maintenance and Repair	225
Core	Grounds	301
Core	Grounds	310
Core	Grounds	311
Core	Grounds	314
Core	Grounds	315
Core	Grounds	318
Core	Other	449
Core	Other	454
Core	Other	461
Core	Other	462
Core	Other	463
Core	Other	464
Core	Other	465
Core	Other	466
Core	Other	467
Core	Other	468
Core	Other	469
Core	Other	470
Core	Other	471
Core	Other	481
Core	Other	482
Core	Other	483
Core	Other	484
Core	Allocations	485
Core	Other	489
Core	Administrative	501
Core	Administrative	510
Core	Administrative	511
Core	Administrative	514
Core	Administrative	515
Core	Administrative	516
Core	Administrative	518
Core	Administrative	522
Core	Administrative	523
Core	Other	527
Core	Other	609

Priority Level	Category	FMAT Category Code
01	Cleaning	120
01	Maintenance and Repair	202
01	Maintenance and Repair	254
01	Maintenance and Repair	255
01	Grounds	345
01	Grounds	346
01	Other	431
01	Other	432
01	Other	441
01	Other	442
01	Other	491
01	Other	492
01	Other	494
01	Other	495
01	Administrative	524
01	Other	531
02	Cleaning	130
02	Cleaning	131
02	Cleaning	141
02	Cleaning	142
02	Cleaning	143
02	Maintenance and Repair	222
02	Maintenance and Repair	242
02	Grounds	341
02	Grounds	342
02	Grounds	344
02	Grounds	348
03	Maintenance and Repair	221
03	Maintenance and Repair	223
03	Maintenance and Repair	224
03	Maintenance and Repair	229
03	Maintenance and Repair	231
03	Maintenance and Repair	232
03	Maintenance and Repair	240
03	Maintenance and Repair	244
03	Maintenance and Repair	246
03	Maintenance and Repair	248
03	Maintenance and Repair	251
03	Grounds	320
03	Grounds	331
03	Grounds	332
03	Other	487
03	Other	498
03	Administrative	512
03	Administrative	520
03	Administrative	521
03	Administrative	526
03	Administrative	529

Figure 12. Modified Accounting Code Schedule, With Priority Level

Case Study 5: TCE Applications to Small Project Procurements

The foregoing cases illustrate some of the problems general to the industry, as well as problems specific to the firm. Each case described a problem, offered a diagnosis, and then concluded with a brief discussion of procedures TCE might suggest for reaching a better outcome. It was illustrated how TCE characteristics of uncertainty, frequency, and specificity when correctly aligned with governance structure, could increase efficiency: provide a better product in less time and for less cost. Throughout the cases, difficulty aligning with TCE was a common theme among the firm. In this final case study, four illustrations are provided to demonstrate how even in such a context, TCE principles applied at the margins can still yield improved outcomes—even when the firm is unwilling to adopt broader changes. Organizational procedural barriers and imposed integrations are bypassed using smaller but similar projects as informal comparison to demonstrate a valid strategy that appears to be consistently effective. A discussion of the concepts found in each follows. See Figure 13 for a dollar by dollar comparison for these project examples.

Case Study 5, Project Examples with TCE Applications to Industry Concerns:

Example #1: Landscape Improvement Project.

A landscape improvement project had been planned for a property in a remote location. The scope of work included paver installation, irrigation system installation, and shrub bed mulch and plants. The field manager solicited a well-qualified and experienced vendor for a non-competitive proposal for the entire scope of work, he priced the work at $29,570. Then, to test these TCE principles explained in this thesis, the field manager disaggregated the scope of work and invited multiple specialties to perform a

part of the project where they either had experience or could easily learn the task, while in-house staff were included for small miscellaneous portions of work that didn't align well with the specialties. Upon completion, the project cost was approximately $17,300, with inhouse costs included. The difference between these two alternative methods of organization was approximately $12,270. A discussion of applicable TCE principles is had in the discussion section later in this chapter.

Example #2: Irrigation Filtration Project.

Grounds are typically irrigated by secondary water in most rural communities in the region. Because secondary water carries suspended particles of debris, the water needs to be filtered before it is sent into the irrigation systems or it will plug off irrigation heads. In 2018, two properties in rural communities about two hours apart had scheduled a filtration upgrade in two separate field management areas that will be referred to as A and B. The scope and scale of each project was closely similar, making the projects an ideal setting for comparing TCE principles in project organization.

Field manager A gave the scope and specifications for the entire project to a vendor considered expert at this work and requested a proposal; the project was priced at $26,233 but actually cost $27,695 upon completion. On the other hand, field manager B utilized TCE principles to align governance and transaction characteristics by disaggregating the scope of work and inviting qualified specialties to perform the parts of work they were most expert at. In-house staff were included in the project for small miscellaneous portions of the work that didn't fit well with the specialties of the vendors. Matching the parts of the transaction and the respective characteristics to specialties in this way, this project for field manager B cost approximately $10,077, including an

approximated $400 for inhouse labor, and it even included an additional scope of work discussed below. The cost difference in the two projects was approximately $17,695.

For field manager B, disaggregation of the transaction meant moving from a single transaction to 15 transactions. Each disaggregated part of the overall transaction was intended to reduce the specificity of the overall transaction. This took more administrative time, but it was time already paid for and didn't incur additional costs to the firm. However, there is a cost here that is difficult to account for exactly. What is the time taken for coordination worth?

In addition, because the project was going well, field manager B added a scope of work to include an additional property improvement costing approximately $3,000, installing a 12-foot-tall parking light lamp with post and footing—work that matched the specialties of vendors already on the job, thus reducing the relative individual cost of both, making the comparative cost difference between the two focal projects, A and B, even greater.

Field manager B performed a second irrigation filter project, with greater concrete and electrical work, in a separate location requiring entirely separate vendors. This project also experienced cost reductions in comparison to the project performed by field manager A. See Figure 13, and the discussion below, for more information.

Example #3: Roof Project Procurements.

Roofing projects were planned for two similar pavilions in two rural neighboring towns about 13 miles apart. These two pavilions will be referred to as C and D. A consultant was hired to design, competitively bid, and manage the roofing project for one pavilion roof (C), while the other pavilion roof project (D) was used as a TCE aligned

project experiment. The cost of the completed project managed by the consultant on project C was $26,737. The cost of the completed project D managed by the field manager was $13,084. The scope of work for both projects was similar, except for the more expensive pavilion roof (C) being slightly larger. The difference between the two alternative methods of procurement is approximately $13,653.

Example #4: Kitchen Upgrade

A design consultant estimated the kitchen upgrade at $40,000, or $36,400 less his fees. The project was disaggregated and coordinated inhouse aligning the capability of the vendors with specialties and inhouse labor for miscellaneous work. The work was completed for $16,782, which is $19,618 less than estimated.

Project #	Title	Production Procurement Method	Managed By	Estimated Cost	Total Cost	Comparable Bid	Comparable Estimate	Comparable Project	Difference From Comparable (savings)
1	Landscape mulch beds, rock mulch, shrubs and irrigation	Coordination	FM	$ 29,750.00	$ 17,300.00	$29,750.00			$12,450.00
2	Irrigation filter and post lamp	Coordination	FM	$ 18,769.00	$ 9,677.42			$ 27,695.00	$18,017.58
3	Irrigation filter and door/lock replacement	Coordination	FM	$ 16,503.00	$ 10,554.62			$ 27,695.00	$17,140.38
4	Pavilion reroof	Coordination	FM	$ 12,882.00	$ 13,083.75			$ 26,737.00	$13,653.25
5	Serving Area Replacement/upgrade	Coordination	FM	$ 36,400.00	$ 16,781.85		$ 36,400.00		$19,618.15
	TOTAL								$80,879.36

Figure 13. Cost Comparisons for Coordinated Work

Case Study 5, Diagnosis:

How did TCE alignments reduce project costs, and still reach a high-quality outcome?

1. A key characteristic of each transaction above is low specificity and reduced uncertainty, achieved through vendors who had the experience, expertise, and capability for the work they were performing with a focus on only what they had the capability to do best. Greater coordination and inhouse cooperation were stressed where areas of uncertainty were the greatest. Although this

increased the quantity of transactions, it greatly simplified the overall performance, reduced uncertainty, and reduced costs.

2. The field manager coordinated any unforeseen conditions, changes in scope, and other surprises, paying for any extra issues as they arose.
3. The vendors were given only the most relevant information, such as a proposed scope and specifications, and then asked to prepare their scope and bid, which became the contract – making contract completeness a simple objective that was driven by the vendors experience, capability, and expertise.
4. Given these transaction characteristics, we were able to govern this work with very simple, clear, purchase orders with each vendor.

Case Study 5, Discussion:

In each of the examples above, we reduced cost by applying this simple TCE alignment insight: reduce specificity and uncertainty by aligning the vendors with what they do best and cover the miscellanea inhouse where coordination and cooperation are best.

It could be assumed that the higher priced vendor in each of the comparable projects would have likely disaggregated and aligned the transactions with expertise in the appropriate governance form, winning these cost differences shown here as a premium profit for his/her own; however, this assumption was certainly a point of failure that brought additional costs to the owner in both case study one and two.

A few questions that arise from this study are as follows: How much of a cost reduction is enough to make in-house project organization alignments truly efficient and cost effective, given time commitments for application? Where is the sweet spot, or the

optimal range for these concepts to yield the highest paybacks? When does it cost more to coordinate and align corresponding characteristics of transactions and forms of governance than it costs to operate in suboptimal, yet bearable conditions? What other motivations, aside from these TCE alignments, would determine whether a firm would bring a function inhouse or outsource it, and why would they be considered over TCE?

Case Study 5, Conclusion:

Transaction heterogeneity can be mitigated through disaggregation of the heterogeneous scope and aligning each part with its proper form of governance by matching transaction characteristics with appropriate governance structures, to achieve efficiency and optimum functionality (Williamson, 1991).

CHAPTER 8

DATA COLLECTION, ANALYSIS, AND RESULTS

Research Methodology:

TCE principles were applied through experimentation and retrospectively through observation in five case studies, to look for patterns of cause and effect relationships that could be explained by TCE. This thesis proposes that TCE can be reliably used as a model for predicting and thus preventing high rates of failure, at least within a corresponding scope and scale in the industry. The scale has been small and the scope, simple, but the connections made encourage future exploration and development of these ideas.

Data Collection/Characteristics:

Data collected has been more theoretical and less empirical. Although difficult to obtain empirical data here, both in this organization and this industry, there is no better place to study these concepts than in the fertile confluence of construction and facility industries where markets, hierarchies, and hybrids mingle and often clash.

Five case studies have combined both observation and experimentation to apply transaction cost economics theory to real issues in the industry.

Data Analysis:

Data analysis has been limited to observation and interpretation.

Results:

In Case Study 1, a market transaction for a project was misaligned with a high degree of uncertainty and specificity. The vendor lacked the knowledge and skill to

meet the high degree of coordination. The project was over budget, past schedule, and of a poor quality.

In Case Study 2, a hybrid transaction for a service was misaligned with a high degree of uncertainty and specificity. The vendor lacked the knowledge and skill to meet the high degree of coordination and the services weren't fully delivered.

In Case Study 3, a firm centralized a task (performance analysis), limiting autonomy and keeping incentives flat by reducing competitive information available to field management.

In Case Study 4, a firm decentralized a task (budget planning), passing uncertainty and a higher degree of specificity onto field management without the autonomy or ownership (incentive) to be accurate. This created an impetus to overbudget.

In Case Study 5, several projects were disaggregated, or decentralized, and tasks assigned to vendors with skills and knowledge to reduce specificity and uncertainty. Inhouse staff were assigned tasks where greater specificity and thus coordination were needed. The result was greater quality at a lower cost than found in comparisons, without the cost/quality tradeoff. Delivering high quality at a low cost required an administrative time investment in coordination, which is difficult to account for.

CHAPTER 9

CONCLUSION

This thesis is motivated by a desire to identify causes for specific industry problems with product delivery performance and business failure. Underlying characteristics that challenge the industry were identified through analysis of certain industry activities. Real industry examples were provided to exemplify the problems and suggest that performance concerns arise as a result of inappropriate responses to these unique characteristics.

This research proposes that most industry problems can be understood and mitigated by the application of transaction-cost economics. TCE suggests that these problems arise from misalignments between the characteristics of transactions and the attributes of governance structures (Williamson, 1991). Several examples of misalignments between transaction characteristics and governance forms have been provided through the case studies which concluded that alignments combining consistent features can reduce problems and reduce costs.

As is exemplified by the firm where these case studies have been taken, and many others in the industry, it is evident that use of TCE requires in depth knowledge and skillful application. As evident from the firm's reluctance to modify existing traditions and processes, encouraging the adoption of TCE will require just as much if not more skill. In the meantime, firms in the industry will likely continue to pay twice, after all, "why pay only once when you can pay twice?"

REFERENCES

Coase, R. H. (1937). The Nature of The Firm. Economica, 4(16), 386-405.

Peterson, S. J., (2013). Construction Accounting and Financial Management. Upper Saddle River, New Jersey, Pearson Education Inc.

Williamson, O. (1991). Comparative Economic Organization: The Analysis of Discrete Structural Alternatives. Administrative Science Quarterly, 36(2), 269-296. doi:10.2307/2393356

Nickerson, J. A., & Silverman, B. S. (2003). Why Firms Want to Organize Efficiently and What Keeps Them from Doing So: Inappropriate Governance, Performance, and Adaptation in a Deregulated Industry. Administrative Science Quarterly, 48(3), 433-465.

Nickerson, J. A., & Zenger, T.R. (2002). Being Efficiently Fickle: A Dynamic Theory of Organizational Choice. Organization Science, 13(5), 547-566.

Nickerson, J. A., & Zenger, T. R. (2008). Envy, Comparison Costs, and the Economic Theory of the Firm. Strategic Management Journal, 29(12), 1429-1449.