A RESEARCH SYNTHESIS OF KEY PARTNERING DRIVERS AND PERFORMANCE OUTCOMES IN ARCHITECTURE, ENGINEERING, AND CONSTRUCTION RESEARCH

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ABSTRACT

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There has been over two decades of research investigating partnering within the Architecture, Engineering, and Construction (AEC) industry. The concept was developed in the 1980s by the US Army Corp of Engineers to mitigate the rise in construction disputes and its damage to business relationships (Gransberg et al., 1999). Much of this research has been centered on "critical success factors" (Black et al., 2000; Cheng et al., 2000) or report performance outcomes (Anderson & Polkinghorn, 2011) for partnering often leaving researchers and practitioners in a state of confusion. Many of these studies lack clear direction to propel the concept forward. As such, some have resorted to detailed literature reviews through qualitative approaches intended to summarize the status of partnering research. A meta-analytic approach is used for this research to synthesize 173 studies from AEC partnering literature. Findings from this study achieves several goals established for this research being: 1) synthesize the body of knowledge in AEC partnering literature; 2) develop a proposed taxonomy of *key partnering drivers* (KPD) and *performance outcomes* with preliminary quantitative evidence from the AEC partnering literature. The results will provide theoretical underpinnings of AEC partnering literature making a contribution to broader organizational knowledge and theory. In fact, this research closes the gap in the literature illustrating a clear connection between *key partnering drivers* and *performance outcomes* using a systematically derived taxonomy.

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that I continue to lay a great foundation for the both of you. To my parents, I know you are proud me for all the doors I continue to break down and I love you for it.

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CHAPTER 1 INTRODUCTION

1.1. Overview

In the Architecture, Engineering, and Construction (AEC) industry individuals and organizations coalesce around a specific project aiming to satisfy project performance goals and objectives. Effective communication, trust, and knowledge sharing are imperative to meet these project performance expectations. In this endeavor, traditional project goals such as cost, schedule, and quality controls are important project performance measures (Yeung, Chan, & Chan, 2009; Cheng, Li, & Love, 2000). Yet, as projects become more complex and face greater uncertainties the need to achieve higher levels of performance is required of construction project teams (Solis, Sinfield, & Abraham, 2013). These teams, in the AEC industry, are commonly involved in projects such as heavy infrastructure, healthcare, transportation, or oilfield construction projects which require greater performance efforts (Barlow, 2000; Losada, 1999; Katzenbach & Smith, 1993). In particular, they need to place team performance above their own individual performance objectives.

Partnering in the AEC industry presents the opportunity to learn how loosely coupled interorganizational project teams (e.g., owner, designer, and contractors) not only enhance project level performance outcomes, but, overall team collaboration and intraorganizational objectives. Research on partnering has existed for two decades or more reporting many benefits, barriers, and dilemmas, yet, consistently misses the implications across study findings. The research commonly examines different phases of AEC partnering being: project initiation and planning, design, delivery, and completion. These various stages of the construction

process provide access to a plethora of both objective and subjective data offering great insight into partnering characteristics. Many of these are perceived as critical to reach partnering project success. Additionally, information becomes available through partnering project performance metrics used to link project performance, process performance, or organizational level performance outcomes to partnering implementation. The literature on *partnering* is saturated with studies identifying factors that are posited as critical drivers of success in partnered project implementation and their impact on project performance outcomes. The factors include but are not limited to: quality specifications and engineering design, effective partnering workshops and facilitation, neutral third party facilitator, continuous partnering monitoring, commitment to partnering concept, respect among participants, and project visibility (Rogge, Griffith, & Hutchins, 2002). Further identified factors elicited through studies are: adequate resources, mutual trust, long-term commitment of the participants involved, coordination, effective support of senior management, clear lines of responsibility and roles, and creativity in problem solving spawned through enhanced collaborations present in partnering (Fisher, 2004; Black, Akintoye, & Fitzgerald, 2000; Cheng et al., 2000). In many of these types of analyses researchers are able to report quantitative results through factor analysis techniques or other statistical inference methods. Though important, this research aims to synthesize a larger body of evidence and provide broader implications in organizational theory.

A better understanding of partnering research, through a meta-analytic approach, opens the possibility to explore links between critical drivers of partnering and its consequences on

project performance outcomes. Within the international business literature a similar case is presented by directing future researchers in meta-analysis use as a valid research methodology. Other researchers have made use of meta-analyses in psychology to links personality traits to overall job satisfaction (Judge, Heller, & Mount, 2002) and in the AEC industry to explore issues surrounding construction industry injuries and interventions (Lehtola et al., 2008). In many of these analyses there are many benefits offered; however, few meta-analytic studies exist in AEC research. As such, an opportunity is present to suggest the practically of meta-analysis as a research methodology to AEC industry researchers. Applications of meta-analytic research in other fields such as marketing provided inspiration and provide guidance to this study (Kirca & Yaprak, 2010). In particular, they help provide for an improved review and synthesis of partnering studies in the AEC field.

The purpose of this research is to satisfy the following objectives. First, this research will thoroughly examine the broad AEC partnering literature and use a meta-analytic approach to synthesize and strengthen the partnering body of knowledge. Second, the research synthesis will identify the boundary conditions of AEC partnering literature and develop a proposed taxonomy of key partnering attributes. Next, this research aims to contribute to broader knowledge of team integration within interorganizational project teams by illuminating theoretical underpinnings from 25 years of AEC partnering research in literature. Last, links are shown between *key partnering drivers* (KPD) and *performance outcomes* using evidence from the literature.

1.2. Background

There has been over two decades of research investigating partnering within AEC industry. Many of these studies provide insight into partnering, a construction methodology that lags behind other traditional methods involved in construction project delivery. Partnering has found its way into many construction industries throughout the world and reports numerous benefits in project performance (Hong, Chan, Chan, & Yeung, 2012). Despite significant advantages offered through *partnering* implementation, it remains underutilized.

The US Army Corp of Engineers developed the partnering concept in the 1980s to mitigate the rise in construction disputes and its damage to business relationships (Gransberg, Dillon, Reynolds, & Boyd, 1999). Studies investigating partnering report many benefits (Anderson & Polkinghorn, 2011; Bubshait, 2001; Black et al., 2000) and success variables (Chen & Chen, 2007; Chan, Chan, Chiang, Tang, Chan, & Ho, 2004; Chan, Chan, & Ho, 2003; Cheng et al., 2000) addressing prescriptive problems found during partnering implementation. In some these analyses researchers maintain cost growth and construction schedules are improved through partnering (Gransberg, Dillon, Reynolds, & Boyd, 1999). Moreover, additional benefits are improved conflict resolution strategies, improved collaboration, stronger relationships and increased trust among project participants (Anderson & Polkinghorn, 2011). Though not partnering is not a panacea, it was recognized as Construction Industry Institute's (CII) "Best of Best Practices" implemented by the fewest (20%) of respondents as reported by an Engineering News Record (ENR) survey in 2011 (Tuchman, 2011). Partnering research, over the decades, has served to shed light to the limited application of its use in the AEC industry.

1.3. Problem Statement

Research over the years group *partnering* studies according to *key partnering drivers* (KPD) to formulate study constructs (Beach, Webster, & Campbell, 2005) or present literature reviews through qualitative approaches (Hong, Chan, Chan, & J. Yeung, 2012; Bygballe, Jahre, & Sward, 2010; Li, Cheng, & Love, 2000), yet, few attempts are made to synthesize their findings using quantitative methods (Olds, Moskal, & Miller, 2005). A gap in the literature exists illustrating a clear connection between *key partnering drivers* (KPD) and *performance outcomes* using a systematically derived taxonomy.

1.4. Description of the Research

This research primarily intends to fill this gap and will use a meta-analytic data collection approach to meet the following objectives 1) synthesize the body of knowledge in AEC partnering literature; 2) develop a proposed taxonomy of *key partnering drivers* (KPD) and *performance outcomes* with preliminary quantitative evidence from the AEC partnering literature. The results will provide theoretical underpinnings of AEC partnering literature making a contribution to broader organizational knowledge and theory.

1.4.1. Research Scope

The literature guiding this research is mainly empirical research concerning both qualitative case studies and quantitative investigations. Yin (2003) maintains research methods such as cross-case syntheses are most appropriate to investigate single or multiple cases studies. In cross-case syntheses, the aim is to aggregate findings across studies through word data tables used to develop patterns and make conclusions through argumentative interpretation (Yin,

2003). Another research method, content analysis, is conducive to both qualitative and quantitative research. Similar to cross-case synthesis, content analysis is used primarily to produce objective, systematic, though quantitative descriptions stemming from communications (Krippendorff, 2012; Kassarjian, 1977). Despite their potential, larger data sets are better suited to other research synthesis methods such as meta-analysis which allow for numeric interpretations in final analyses and conclusions (Cooper et al., 2009; Yin, 2003; Lipsey & Wilson, 2001). Additionally, this research does not aim to examine communication occurrences within cases or research studies, but to analyze and aggregate their findings.

The primary intent for this research is to extensively review AEC partnering literature, combine salient attributes informing partnering project success, and show links between performance outcomes. To do this, a meta-analytic research synthesis is conducted examining approximately 25 years of partnering research in the United States (US) and other countries such as the United Kingdom (UK), Australia (AU), and Hong Kong (HK). A meta-analysis allows researchers to summarize, integrate, and interpret findings into one informative study (Lipsey & Wilson, 2000). The purpose is to aggregate as many high quality studies reporting both qualitative and quantitative results stemming from empirical research.

The focal points of this research are project partnering studies conducted across multiple countries brought together through a comprehensive literature review. The primary motivation for this is to capture studies published in top construction management journals and other scholarly sources over the past 25 years of partnering research (Hong et al., 2012; Chau Kwong, 1997). A concern within this research is partnering attributes and performance outcomes are

frequently reported qualitatively, which is not conducive to a thorough meta-analysis. Despite this, the analysis will report both qualitative findings resulting from the initial search of AEC partnering literature and quantitative results using a meta-analytic approach.

As a result of the meta-analysis, outcomes of this study will part from traditional *partnering* research efforts and establish a sound justification connecting *key partnering drivers* and implications on *performance outcomes* as reported throughout the literature. Although useful, the landscape is littered with varying "critical success factors" which leave researchers and practitioners perplexed (Chan et al., 2004; Cheng et al., 2002; Black et al., 2000; Cheng et al., 2000). In that, clear direction on partnering antecedents and performance impacts remains elusive for those seeking to concentrate efforts in partnering practice and research.

Conclusions derived through exhaustive investigations required in meta-analysis, are not without limitations. It is therefore acknowledged that results are not meant to cover the entire field of partnering literature diverging across industries. Despite this limitation, prominent sources in AEC literature are scoured to produce results which are validated and developed through a sound methodology consistent with meta-analysis literature. The intention to limit studies to top construction management journals and other key sources entailing robust studies is to help eliminate erroneous results which may surface when broader methodological criteria are established when selecting studies. Although this may limit the generalizability of this study, unreliable studies are also avoided providing even greater validity in study results (Cooper, Hedges, & Valentine, 2009; Lipsey, M & Wilson, D., 2001).

1.4.2. Deliverables

Deliverables resulting from this study are:

1. Evidence based guidance to AEC *partnering* researchers and practitioners as to links between *key partnering drivers* and *performance outcomes* through both qualitative and quantitative findings.
2. A theoretical contribution to knowledge within interorganizational project teams.
3. Future guidance to researchers regarding the applicability of meta-analytic approaches in AEC research.

1.5. Readers Guide

A literature review on *partnering* in AEC industry is conducted and resides in Chapter 2. This is followed by Chapter 3 which describes the research methodology, including strategy and development of the meta-analytic research approach ascribed to meet research objectives and goals as presented. The partnering taxonomy development and coding strategy are presented in Chapter 4, along with findings as a result of research synthesis conducted for this study. The final chapter, Chapter 5, provides a summary of the results. It also offers final conclusions, contributions to the AEC field and body of knowledge, along with limitations and recommendations for future research, respectively.

CHAPTER 2 LITERATURE REVIEW

2.1. History of Partnering

The concept of Total Quality Management (TQM) as a sound business management practice in the AEC industry planted the seeds necessary for the emergence of *partnering* (U.S. Army Corps of Engineers, 2010). Although this concept appeared in the 1980s AEC industry, it is not a unique practice. *Partnering* has existed in many formats and across multiple industries such as automotive, telecommunications, education, and business management in general. To understand the history of partnering it is, therefore, important to explore other instances where partnering has shown its applicability and presented challenges.

2.1.1. Partnering Across Industries

As businesses attempt to gain competitive advantages while controlling costs and quality, many resort to partnering (Mentzer, Min, & Zacharia, 2000; Hagedoorn, 1996; Lambert, Emmelhainz, & Gardner, 1996). To understand the significance and history of partnering it is useful to briefly review its use within other industries outside of the AEC industry. Industries such as technology, automotive, and public-private partnerships, to name a few, have successfully engaged in the partnering concept and are discussed next.

In the technology industry this strategy is undertaken for several reasons, namely to share in research and development (R&D) activities with other companies and to gain greater access to new market opportunities (Hagedoorn, 1996). Within the business sector this inter-company strategic partnering arrangement is often maintained through joint ventures or established in R&D contracts. Often times these agreements are formulated among large companies which

dominate their respective industries. For example, Microsoft entered a joint venture with a smaller Japanese company Mitsui in 1987 to develop microprocessors (Hagedoorn, 1996). This and other joint ventures are found across the landscape and all seek to effectively leverage their internal abilities with that of identified partners to benefit both parties.

The rich history of partnering is further evinced in business supply chain management. The automotive and telecommunication industries are among the best examples of supply chain partnering use. In particular, companies such as Toyota and General Motors (GM) use supplier partnering to improve cost, process, and deliver better quality and performance to their customers (Brennan, 1997). Other perceived advantages of supply chain management are joint-problem solving and information sharing, which are synonymous with AEC partnering goals. Though this type of partnering is beneficial, it is not without pitfalls. Brennan (1997) identified some common hurdles as: large financial investments in the company alignment process (e.g. facilities and equipment), over reliance on partner for continual business, and business stagnation or complacency resulting in missed opportunities for new markets.

Supply chain partnering juxtaposed with AEC partnering show many parallels which are examined later. Nevertheless, it is critical to identify several partnering antecedents and implementation factors present within the retailing industry suggested by (Mentzer, et al., 2000). For example, Mentzer et al., (2000) posit interdependence, conflict resolution, trust, commitment, organizational compatibility, and top management vision as antecedents required to effectively implement partnering. They further contend, that proper implementation is maintained through information sharing, technology use, establishing strategic interface teams,

addressing organizational barriers, maintaining joint programs, understanding asset specificity, and establishing joint performance measures. While examining these factors it becomes evident that multiple industries suffer from similar concerns when deciding to partner and with effective partnering implementation.

A final area where partnering has existed is within public-private partnerships. This area concerning partnering tends to reside in public policy initiatives where parties attempt to join for-profit sectors with public organizations or institution. In many of these partnering arrangements the aim is to increase efficiencies and budgetary constraints by leveraging private sector resources (Mazouz, Facal, & Viola, 2008). This type of partnering even persists in education, for example, charter schools commonly partner with local non-for profit or private entities to supplement resource needs (Smith & Wohlstetter, 2006). Smith and Wohlstetter (2006) maintain public-private partnerships in this format can exist either through formal or informal agreements depending on the level trust among the parties. Moreover, the public-private partnerships offer mutuality in resources such as financial, human, physical, or to ensure organizational needs of either party are met.

With these various industry perspectives in mind, it is important to understand the evolution of partnering in the AEC industry. In addition, a noticeable theme is present in the commonalities within each industry especially how partnering is developed and implemented.

2.1.2. Partnering In the AEC Industry

Partnering has taken on many meaning across industries. Therefore, the CII Partnering Task Force defines *partnering* as a "long-term commitment between two or more organizations aiming to maximize the effectiveness of each participant's resources while working toward joint business objectives (CII, 1989)." It is argued that the construction landscape changed in the 1970's as a result of declining economic conditions ushering in new business improvement strategies (CII, 1989). As a consequence, *partnering* in the AEC industry is suggested to have developed during this period as a strategy to help businesses address these economic challenges working jointly toward common goals and objectives, while spreading risks equally among participants. As *partnering* implementation blossomed defining characteristics and variations in its use began to develop.

2.2. Partnering Types

Partnering is typically provided in several variations (i.e., *project partnering* and *strategic partnering*) and can be followed under any project delivery method or can stand alone contractually (Lahdenperä, 2012; Loraine, 1993). The goals for many project stakeholders (i.e., owners, architects, engineers, and contractors) are to deliver high quality projects on time and under budget (Anderson & Polkinghorn, 2011). With this motivation in mind, project stakeholders often rely on the contract to provide direction to the team. In addition, increasing team collaboration and communication is attributed to project performance outcomes. Partnering is frequently posited as beneficial to achieve these goals.

Though not the most common partnering type, *strategic partnering* offers clients and other key stakeholders the best chance to overcome high risk and uncertainty in external environments

(Bennett & Peace, 2006; Barlow et al. 2000). This is partly due to the longer durations involved in the project delivery process. A contractual partnership is also established in this format between organizations and can be followed across multiple projects or on a single project. Therefore, *strategic partnering* provides a cooperative environment to deal with concerns in individuals' levels of commitment, motivations, and perceptions all stemming from trust.

2.2.1. Characteristics of Partnering

As organizations works to foster collaborative environments through use of *partnering*, several prominent characteristics are present. These characteristics are found within the *partnering* structure that develops during *partnering* initiation and implementation. Several attributes of *partnering* such as mutual trust, shared vision, long-term commitment, dedication to common goals, equal expectations and values are commonly reported as the foundation of *partnering* (Crowley & Karim, 1995; CII, 1989). Though the aforementioned attributes are not an exhaustive, many researchers begin with these *partnering* characteristics which are further displayed through a conceptual model.

A conceptual model is beneficial to understand how partnering organizations operate within shared boundaries to meet the project specific objectives. The model in Figure 2-1 depicts three partnering project organizations. The organizations in this case are represented as owner/client, designer, and contractor. The partnering boundary develops among the project participants. From this, Crowley and Karim (1995) posit that a semi-permeable boundary exists

within the *partnering* structure. This semi-permeable boundary allows partnering stakeholders

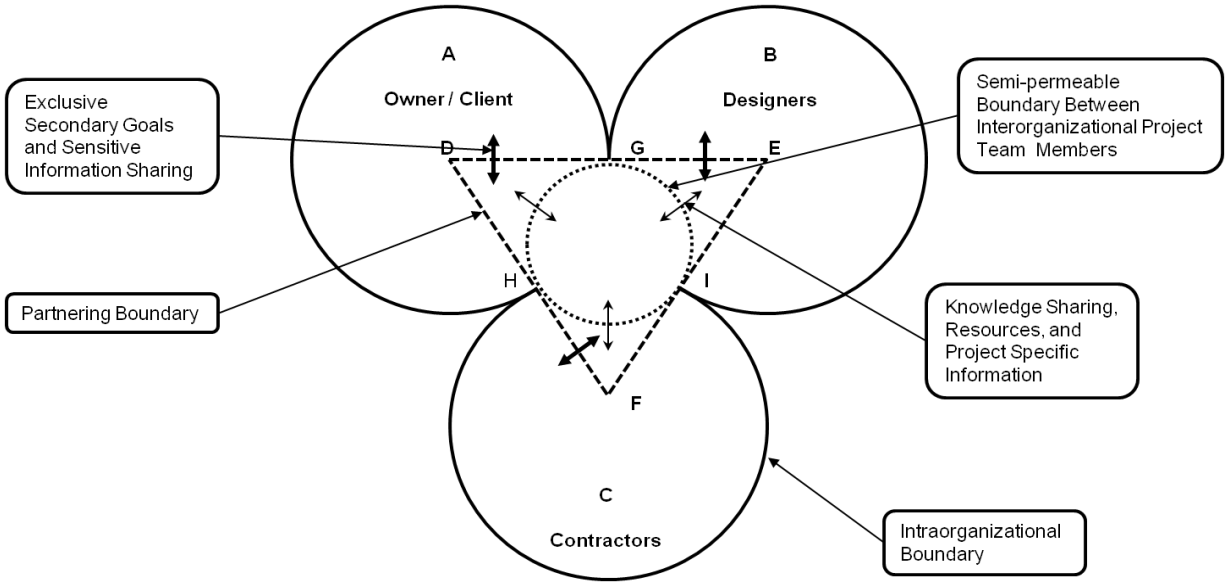


Figure 1: Conceptual Model of Partnering Developed Based on Cheng (2000) and Crowley & Karim (1995).

to share knowledge, resources, and exchange project specific information. The letters D, E, F, G, H, and I situated along the partnering boundary represent individuals either working at the interorganizational level (G, H, I) or the intraorganizational level (D, E, F). In this format, partnering participants are also able to provide innovative problem solving ideas to address issues quickly and effectively when they share contiguous organizational boundaries. The arrangement also affords organizations the ability to mitigate confidential or sensitive information from leaking between organizations.

Partnering boundaries, in particular the semi-permeable boundary represents a project network and takes on similar characteristics of high performance teams (HPT). In the analysis of Chinowsky et al. (2010) several project network characteristics are identified as necessary for HPTs and are categorized as mechanics (i.e., information and knowledge exchanges between

actors) and dynamics (i.e., motivation for individuals or actors to achieve high performance). The mechanics in *partnering* occurs at both the interorganizational project level and intraorganizational level. Contention among several authors suggests these factors as critical to determine whether an organization can achieve high levels of knowledge sharing at the intraorganizational level analysis (Chinowsky et al., 2010), across geographical boundaries existing within intra-organizations (Javernick-Will, 2011), and at the interorganizational project level (Zhang & Ng, 2013; Solis et al., 2013; Chinowsky et al., 2011; Chinowsky et al., 2008). Key interaction components confounding communication and knowledge exchanges stem from the underlying network structure in that ease of knowledge transfers is dependent on the tie strength between individuals and the type of knowledge exchanged (Reagans & McEvily, 2003; Hansen, 1999).

In this assessment, strong ties (i.e., closely connected and frequent interactions) in knowledge exchanges are not always correlated with effective performance, rather weak ties (i.e., distant and infrequent interaction) can also afford access to tacit knowledge so long as it is easily codified (Reagans & McEvily, 2003; Hansen, 1999; Granovetter, 1973). While this is true, explicit knowledge is reported as best transmitted through non-redundant weak ties (Bresnen et al., 2003; Hansen, 1999). Tacit knowledge may involve information learned from working with the client on previous projects. Moreover, if the tacit knowledge or information is complex, such as a new construction method or a constructability problem encountered, the weak tie is less beneficial. Reagan and McEvily (2003) and Bresnen et al. (2003) further argue knowledge

transfers are best when project team members share knowledge in common or mental models as a result of their individual attributes (i.e., same discipline, same cohort, etc.).

2.2.2. Partnering and Project Performance Outcomes

The success of partnering is illuminated across many studies in AEC literature. At the project level researchers have investigated *partnering* implications on transportation and bridge projects (Anderson & Polkinghorn, 2011; Gransberg et al., 1999). Other research, again, directs attention on perceptions of those with extensive *partnering* experience (Chan et al., 2004; Chan et al., 2003; Black et al., 2000). The multitude of studies conducted report many findings informing how goals and objectives are met through partnering. Some report measurable outcomes in *partnered* vs. *non-partnered* projects, in that *partnered* projects' show (Chan et al., 2004; Black et al., 2000; Grajek et al., 2000; Gransberg et al., 1999):

- Lower project related cost growth
- Projects completed at or under budgeted cost
- Reduced project related cost growth per change order
- Shorter construction schedules than planned
- Zero costs associated with disputes and claims
- Fewer disputes and claims
- Increased quality satisfaction
- Increased satisfaction in working relationships

Notwithstanding these positive attributes, others maintain *partnering* success hinges on less salient variables that are difficult to quantify.

Successful implementation of *partnering* and subjective outcomes can be found throughout the literature, as well. A study conducted by Chan et al., (2003) is helpful in identifying relational variables found in *partnering* which are conducive during all phases of construction being: establishing and clearly communicating conflict resolution strategies; willingness and openness to resource sharing among project participants; clear direction as to lines of responsibilities for team members; working with win-win attitudes; and feedback through regular monitoring of *partnering* process. Construction project stakeholders working to effectuate successful *partnering* stand to benefit from analyses such as Chan et al. (2003), in that, all of these variables appropriately attuned can lead to better team collaboration and success in project performance goals. These are primary motivations behind many project stakeholders and are presented through *partnering.* Notwithstanding, research investigating *key partnering drivers* (KPD) are among the most prominent in *partnering* literature.

2.2.3. Partnering Knowledge in the AEC Industry and Barriers to Its Implementation

The Architecture, Engineering, and Construction (AEC) industry is an environment where many relational transactions exist. These transactions occur during project planning, design, and construction phases involving construction projects. The motivations behind many of these transactions are constrained by the type of project delivery method or contractual arrangement employed. There are traditional project delivery methods such as Design-Bid-Build (DBB), Construction Management (CM), and Construction Management - At Risk (CMR). Along with,

other emerging project delivery methods or arrangements such as Design-Build (DB), Integrated Project Delivery (IPD), and *partnering*. Because *partnering* can be followed contractually or philosophically, it can enhance most project delivery methods helping to promote team integration (Lahdenpera, 2012; Yeung et al., 2012; Saunders & Mosey, 2005). Mollaoglu-Korkmaz et al. (2013) further maintain the level of team integration achieved is directly associated with the project delivery method followed on the project. This, in turn, results in optimized project performance outcomes.

Despite the potential benefits for the AEC industry, some argue partnering will continuously find resistance to its implementation. This is identified in developing partnering literature which suggests partnering is more of a fluid process which relies on many social aspects that are deeply rooted in individuals' behaviors, which are difficult to change (Hartmann & Bresnen, 2011). As such, many claim the AEC industry is, and will remain, an adversarial industry fueled by profit motivations (Drexler Jr. & Larson, 2000). For example, Bresnen (2007) contends individuals' motivations and attitudes to foster an environment where trust and openness are present get constrained due to several factors. Among these are difficulties in maintaining the collaborative goals and objectives, encouraging conformity, opportunism, and setting superficial benchmarks or targets. In particular they contend partnering exerts normative pressures on individuals stifling innovative thinking within the team. This may also lead to opportunistic behavior where major partnering members take advantage of smaller tier contractors or suppliers, thereby, impacting trust.

In the meanwhile, *partnering* attempts to encourage trust over a single construction project, while dealing with the aforementioned concerns. In this, the notion is lack of commitment and unwillingness to compromise are challenged over a short time span (Ng, Rose, Mak, & Chen, 2002). Dietrich et al. (2010) assert discontinuity in projects inhibits collaboration which, in a project based industry, performance is contingent upon. Although this is true, successful collaborative efforts can serve as a catalyst reinforcing *partnering* motivations with the potential for future work. More importantly, Drexler and Larson (2000) maintain trust is developed over the course of *partnering* projects creating reinforcing causal loops. In that, more time spent working through challenging problems and dealing with the frustrations of the project adds to individuals' credibility and character. This continuous engagement fosters greater trust in project team members. Still, others argue *partnering* is not a one size fits all solution for construction projects (Eriksson, 2010). Therefore, we should also address the best applications for *partnering* to help understand its applicability.

According to Lahdenpera (2012) and Eriksson (2010), *partnering* is most suitable for complex projects involving high-risk and uncertainties such as infrastructure projects. Within this application, project performance benefits are typically shared between owner and other project stakeholders. Meaning multiple parties stand to reap rewards from *partnering.* There are two variations of partnering, one of which is best suited for these types of projects encouraging trust and long term commitment among all parties. The two *partnering* types are *project partnering* and *strategic partnering*. *Project partnering* refers to relationship established for a single project, while *strategic partnering* implies a long-term commitment over several

projects (Li, Cheng, & Love, 2000). Both exhibit key strengths and weakness in partnering implementation yet are still beneficial to enhance performance outcomes.

Recent research on partnering investigates AEC industry perceptions on barriers to *partnering*, suggesting areas where attention is needed in practice (Korkmaz, Sparkling, & Thomas, 2014; Thomas, 2013). In particular the studies identify four prominent categories from which barriers are found being: cultural (i.e., traditional construction silos with distinct individual organizational boundaries and objectives), organizational/program level (i.e., perceived unequal risks sharing and time committed to the process), project team (i.e., misaligned goals and objectives, lack of workshops and training earlier in process), and legislative/governance (i.e., laws and regulations encouraging competitive bidding rather than technical competence or expertise). Findings show project team member's willingness to adopt the *partnering* philosophy as a significant barrier followed by lack of trust among project participants. Furthermore, lack of partnering training programs and workshops early on in the project planning and design phase are likely culprits impeding *partnering* implementation possibly leading to confusion among the project teams or feelings of unfair sharing of the risks associated with the project (Korkmaz et al., 2014; Thomas, 2013).

Despite concerns purported by some researchers, the key to overcoming implementation barriers are found in the relational aspects of partnering such as trust. In fact, Kumaraswamy et al. (2005) point out that mistrust is often reported within traditional contract delivery methods (i.e., DBB, CM, and CMR) where team integration and collaboration are not the focus. Rather, relational contracting approaches such as *strategic partnering,* and even *project partnering,*

offer the best deterrents to combat distrust and alleviate traditional adversarial mentalities found in construction. Even more, the construction industry relies upon established relationships and maintaining trusting relationships helps everyone meet company and project specific objectives.

Another perspective offered through literature maintains *partnering* is a dynamic relationship between interorganizational project team members. In this stream of literature it is argued that *partnering* challenges individuals and organizations to deviate from deeply rooted behaviors and routines developed over time (Gottlieb & Haugbolle, 2013; Hartmann & Bresnen, 2011). This perspective focuses on the conceptualization aspects of *partnering*, rather than procedural processes, helping researchers understand the theoretical connections. For example, Zhang and Ng (2013) attend individuals in construction teams behold extensive amounts of core knowledge in their respective disciplines. They contend, effectively leveraging this pool of expertise can aid collaboration, joint problem solving, and improve efficiencies in project delivery efforts. More importantly, they argue volitional knowledge sharing originates from ones' attitude towards knowledge sharing and perceived behavioral controls. That is, motivation for sharing information is perceived as beneficial by the individual and appropriate opportunities, resources, or tools are present for these knowledge exchanges to successfully occur. In this, it is implied enhancing knowledge sharing in organizations is beneficial to achieving team integration, improving the efficacy in works processes, and transferring knowledge across multiple projects (Zhang & Ng, 2013; Dietrich, Eskerod, Dalcher, & Sandhawalia, 2010; Bresnen, Edelman, Newell, Scarbrough, & Swan, 2003).

Knowledge in the context of AEC project teams put forward by Zhang and Ng (2013) is "a fluid mix of framed experience, values, contextual information, and expertise insight that provides a framework for evaluating, and incorporating new experiences and information." In *partnering* this knowledge and information sharing is imperative for project success and increased team collaborations (CII, 1991), but remains a challenge due to the temporary nature of construction project teams (Bresnen et al., 2003).

2.3. Preliminary Review of Partnering Framework

Partnering also exhibits other characteristics identified by key drivers or anticipated performance outcomes. For example, Beach et al., (2005) suggests partnering success is predicated upon factors such as top management commitment, partnering workshops, early implementation and involvement of key participants. Factors such as this are classified as *key partnering drivers* (KPD) and are used to develop a conceptual partnering framework. The KPD are divided into three distinct subordinate categories being: planning and procurement oriented, relationship oriented, and process oriented. In this taxonomy of *key partnering drivers* a positive link to *partnering* success is present; moreover, *performance outcomes* are often seen as consequences resulting from the process. Chapter 4 will expound on the basis for these categories, though a brief synopsis is given next.

2.3.1. Key Partnering Drivers

Planning/Procurement Oriented: Refers to those variables identified early on in the decision making process when potential project participants are deciding to pursue partnering.

Relationship Oriented: Refers to key variables found during the partnering life-cycle to improve relationships and enhance relationship management within interorganizational project teams.

Process Oriented: Refers to identified variables occurring during partnering implementation process necessary to ensure the efficacy of partnering process.

2.3.2. External Moderator

Public Sector Constraints: Important public sector concerns (e.g., bureaucratic public client organizations, or stringent public rules, regulations and laws which may discourage partnering implementation such as competitive bidding) attenuating the success of *partnering*.

Performance Outcomes

The *performance outcome* categories are bifurcated into two exclusive constructs: *project performance* and *organizational performance*. These constructs are posited to distinctly classify performance characteristics attributed to *partnering* reported in AEC *partnering* literature. The first category, *project performance*, is further divided into four subordinate categories. These categories are *cost performance*, *schedule performance*, *quality and safety performance*, and *dispute and litigation performance*. Meanwhile, the *organizational performance* construct is separated into *process performance* and *intraorganizational performance*. A definition is given next for each of constructs mentioned above.

2.3.3. Project Performance Outcomes

- *Cost Performance*: Related to those cost improvement outcomes attributed to partnering identified during partnering implementation and evaluated at project completion.
- *Schedule Performance*: Related to outcomes associated with improved project durations which are ascribed to *partnering* process evaluated at project completion.
- *Quality/Safety Performance*: Related to outcomes involving project safety improvements and design quality shown to reduce waste and inefficiencies during partnering process evaluated at project completion.
- *Dispute/Litigation Performance*: Outcomes referring to the reduction of disputes and litigation attributed to *partnering* process resulting in better claims and issue resolutions.

2.3.4. Organizational Performance Outcomes

- *Process Performance*: Process related improvements in interorganizational team collaboration learned through *partnering* process and available for feedback into all stages of the process.
- *Intraorganizational Performance*: Intraorganizational related outcomes beneficial to long term organizational success evaluated after project completion.

The aforementioned *partnering* categories to which attributes are classified are developed through extensive an AEC literature review. From this it is evident that many dependent and independent variables describing *key partnering drivers* and *performance outcomes* are

present, therefore, a meta-analytic approach was followed in this research. The following sections provide a brief overview of meta-analyses as a methodology to explore wide bodies of existing research and its benefits in synthesizing the literature.

CHAPTER 3 RESEARCH METHODOLOGY

3.1. Research Strategy

The primary goal of this research is to gain a deeper understanding of 25 years of *partnering* research in AEC literature through a research synthesis. In doing so, the following objectives are established for the research:

1. Synthesize the body of knowledge in AEC partnering literature.
2. Develop a proposed taxonomy of *key partnering drivers* (KPD) and *performance outcomes* with preliminary quantitative evidence from the AEC partnering literature.

The results will provide theoretical underpinnings of AEC partnering literature making a contribution to broader organizational knowledge and theory.

To study the relationship among variables many researchers implore the use of a quantitative research design to investigate and test hypotheses (Creswell, 2009). The objective for this study is to learn the relationships between *key partnering drivers* and *performance outcomes*. To do so, a preliminary quantitative research design is used following a similar strategy as that with non-experimental research. A quantitative research design was chosen for this study because the methodology is conducive for interpreting links between dependent and independent variables using a survey instrument to convert them into numeric descriptions which are then available for statistical analysis (Creswell, 2009).

The research strategy followed for this study is shown on Figure 2. The overall research strategy is complemented by a five step meta-analysis approach namely: 1) Identify *key partnering*

drivers and *performance outcomes* reported in the AEC literature published in top tier construction management research journals, and other key publication sources, which are used to formulate study constructs and establish coding criteria; 2) Collect homogeneous studies reporting correlations between *key partnering drivers* and *performance outcomes* derived through empirical research; 3) Categorize studies according to research design (e.g., quantitative, qualitative, mixed-methods, or anecdotal) and other criteria established by coding sheet; 4) Data evaluation resulting from coding, and; 5) Interpret and discuss findings as a result of meta-analysis (Kirca & Yaprak, 2010; Cooper et al., 2009; Lipsey & Wilson, 2001).

The problem identification, need for the research, and literature review were discussed in Chapter 1. Therefore, the next sections will focus on the subsequent steps followed in this research and provides a brief introduction to meta-analysis as a research method.

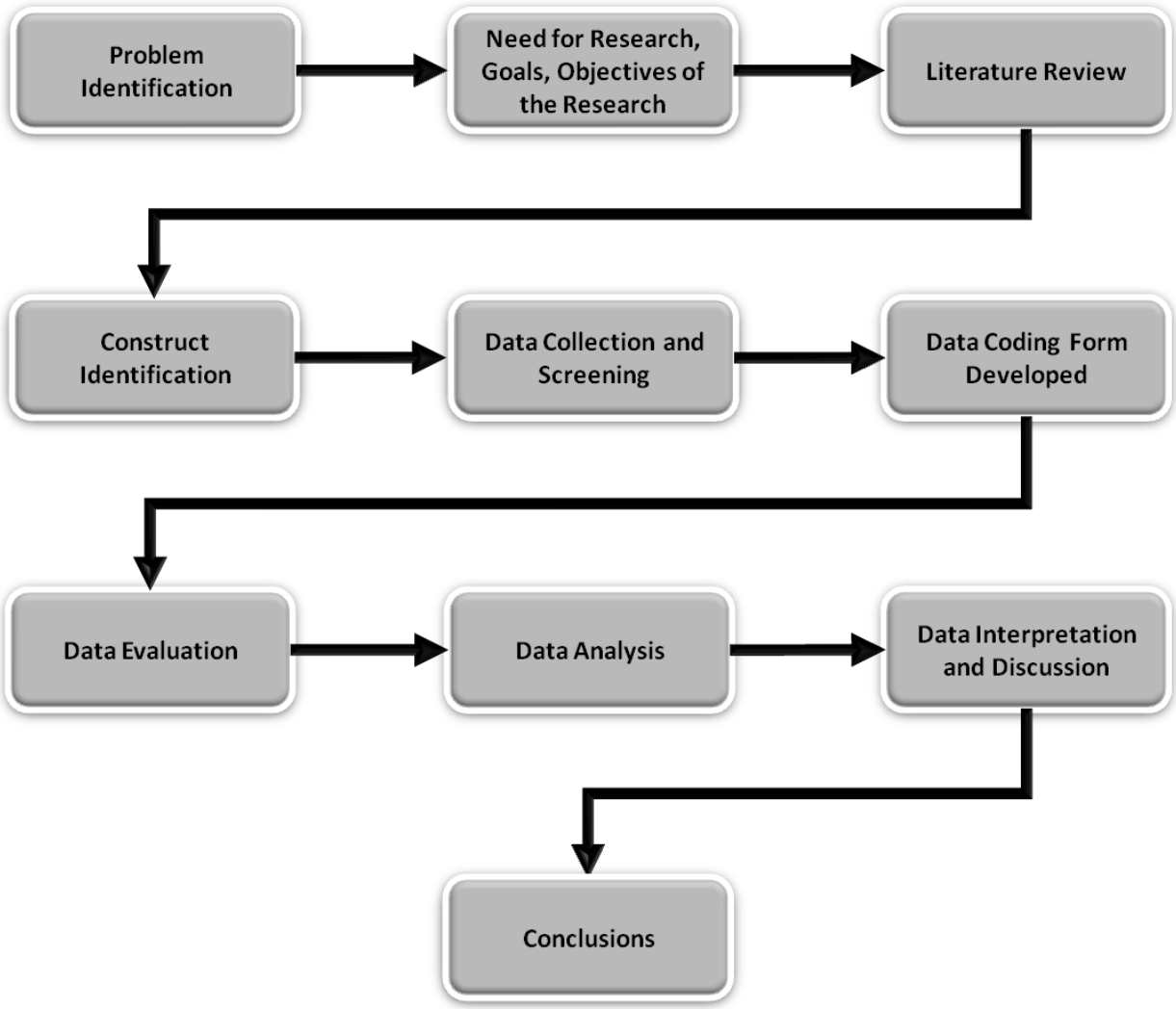


Figure 2: Research steps followed in this study.

3.2. Meta-Analysis: A Scientific Method to Explore New Paradigms via Existing Research

According to Cooper et al. (2009), the current era of meta-analysis was spawned from psychotherapy research by Glass (1976) and Rosenthal and Rubin (1978). From this nascent stream of meta-analysis work, the early 1980s experienced significant growth in meta-analyses focused on methodology and statistical inferences resulting from this research method.

According to Lipsey and Wilson (2001), meta-analyses rapidly moved to research conducted in social and health sciences, along with education and psychology.

A meta-analysis is similar to survey research, in that, research reports are surveyed rather than people. Meta-analysis is an ideal way to summarize, integrate, and interpret scholarly studies and combine findings into a grand mean effect for key variables. First and foremost, the studies must meet several criteria for consideration in meta-analysis being: empirical studies reporting quantitative findings using descriptive or inferential statistics for data analysis, entail comparable constructs and variables, and work with similar statistical formats (Cooper et al., 2009; Lipsey & Wilson, 2001). A limitation in this resides in the determination of relevant studies, which is subjective to the researcher conducting the MA. The findings from each study are interpreted through *effect sizes.* This *effect size* is defined according to Lipsey & Wilson (2001) as: "a statistic that encodes critical quantitative information from findings within each relevant study." From this, key benefits are afforded to investigators and are shown by the various uses shown in literature.

A recent meta-analysis conducted in the AEC literature utilized the approach to understand burgeoning project management research involving knowledge brokering (Holzmann, 2013). The research explores 10 years of project management research to elicit areas for future research through a content analysis shedding light on current research trends. To do so, a content analysis approach is offered examining industry sector, project type, country, and the characteristics of knowledge transfer. Findings from this research provide a great roadmap to future investigators as to emerging trends in knowledge brokering research. Although the

objective of the research is achieved and is presented using descriptive and qualitative information, it lacks a final summary of effect size resulting from statistical analysis as required in typical meta-analyses (Cooper et al., 2009; Lipsey, & Wilson, 2001).

In engineering educational research, meta-analysis is cited as a promising technique to explore students, faculty, and engineering communities (Olds et al., 2005). Despite this, they attest it remains under reported or utilized in engineering research. Olds et al. (2005), also explain how research in the engineering educational community stands to benefit if they effectively leverage emerging descriptive designs such as conversational analysis, observations, ethnographic studies, and more importantly meta-analyses. Similarly, AEC literature is lacking in its use of this promising methodology which, for example, afforded engineering education researchers to assess the impacts of technology use on student learning across 760 articles (Olds et al., 2005). Specific benefits resulting from meta-analyses are discussed next.

3.2.1. Benefits of Meta-Analysis

A thoroughly conducted meta-analysis has many benefits to researchers and practitioners. In meta-analytic research the results may not only synthesize previous research, but, offer researchers valuable information on potential relationships that have not been explored in the data. For example, a model based or model driven meta-analysis examining the intercorrelations among constructs or variables may posit connections that independent studies fail to examine (Cooper et al., 2009). Additionally, by examining longitudinal data in meta-analyses, the synthesist may be able expound theories as a result of unknown

connections such as mediating or confounding variable relationships that are otherwise not accounted for in bivariate analysis (Cooper et al., 2009).

A practitioner reading a meta-analysis or research synthesis also stands to benefit from information gleaned from the research. Many practical implications are put forward through meta-analyses, however, they predicated on the particular contextual question explored and the reporting methods. For example, Cooper et al. (2009) maintains research synthesist should make efforts to include all studies in some format as to help readers understand the broader literature stream even though some may not be conducive to typical meta-analytic reporting on effect sizes. Therefore, synthesist should try to present findings such that practitioners and researchers can make sense of whether descriptive statistics, qualitative, quantitative or a combination of all the various reporting methods.

Research findings common to many studies according to Cooper et al., 2009 and Lipsey and Wilson (2001) are:

- **Central Tendency Description:** Characteristics of single sample respondents reported using mean, median, mode, or proportions. These are compatible for computing effect sizes; although it is critical variables are the same for all studies.
- **Pre-Post Contrasts:** These studies are single sample central tendency comparisons, however, variable are measure as change over time. Resulting descriptive statistics are typically reported showing relationships between two values as gains or differences

among respondents. Effect size is calculated as standardized differences between means.

- **Group Contrasts:** These types of studies involve two or more groups of respondents drawing comparisons across groups. In addition, one or more variables are measured within the studies and are reported using descriptive statistics, again, central tendency values such as means or proportions.
- **Association between Variables:** This type of research typically represents responses using covariation over respondents of two variables looking for correlations between them. Results are commonly reported as a correlation coefficient or derived through variable cross tabulation efforts. For example, odd-ratio, lambda, chi-square coefficient, or other similar statistical measurements to understand correlations between variables.

These categories are prominently identified within findings resulting from many studies. Meta-analyst should carefully identify consistencies among studies through this categorization process. This, again, initiates the process to which the meta-analysis can begin to set other criteria necessary to begin searching and collecting appropriate studies. In this study the association between variables is followed.

3.2.2. Use of Meta-Analysis and Directions from the Literature

Meta-analysis research is ubiquitous and broadly extends across many disciplines in scholarly literature. In business literature researchers have utilized a meta-analysis to assess market orientation antecedents and the implications on performance (Kirca, Jayachandran, & Bearden, 2005). In their analysis, the research approach was useful to consolidate findings from previous

market orientation and performance relationship literature, while also helping to eliminate inconsistencies and guide practitioners to problem areas management can place greater emphasis to enhance company performance objectives.

3.3. Data Collection and Screening

Data collection commences after a cautiously developed study criteria is created. The research criteria set forth during design, aims to define the best population for eligible studies without placing stringent limitations to maintain the study samples as representative. An effective search strategy attempts to gather research from various sources include but are not limited to: review articles, study references, computerized bibliographic databases, bibliographic reference volumes, journals, authors in the area or topic, government agencies, and conference proceedings (Cooper et al., 2009; Lipsey & Wilson, 2001).

An effective search strategy attempts to gather research from various sources include but are not limited to: review articles, study references, computerized bibliographic databases, bibliographic reference volumes, journals, authors in the area or topic, government agencies, and conference proceedings. Many strategies also exist to identify studies using various search programs and search methods such as Boolean logic to find key words or phrases. The search strategy used in this research is similar to that of Hong et al. (2012), as far as key word search for "*partnering*" or "*project partnering*" or "*strategic partnering*" included in the title or abstract. In addition, the search is limited by year, subject area, language, and document type.

Through a meta-analytic approach, this research aims to uncover correlations between *key partnering drivers* (KPD) and *performance outcomes* in AEC literature. In doing so, the following criteria acted as bookends for the research:

1. *Partnering* research in AEC literature from 1984 - present (Hong et al., 2012; Li et al., 2000; CII, 1989).
2. Leading construction management journals (Hong et al., 2012; Chou Kwong, 1997).

Three prominent search engines ProQuest, Science Direct, and Scopus where used to collect relevant studies. In addition, manual searches of leading construction management journals were completed. The initial search produced 622 studies from which the abstracts were scanned to determine if the article should be further considered for greater analysis. An additional manual search strategy is used to scan key journals for any additional studies investigating AEC *partnering.* Many studies where removed through data evaluation and screening for double counting, relevancy (e.g., word *partnering* used in the abstract or title although no connection to AEC *partnering* exists), and/or inclusion error such as partnering within a different context (e.g., *partnering* concerning public/private partnerships). A snapshot of the final list of 173 partnering related studies as a result of the second stage analysis is shown on Table 1, and includes articles collected from references or other search strategies including industry collaboration. The list was reviewed by an expert panel to improve the reliability of the final list of partnering related studies; most importantly, this is undertaken to ensure all relevant studies are included in the analysis.

Table 1: Snapshot of Final List of Partnering Studies as a Result of this Study (Full List of 173 Studies provided in Appendix A).

Author(s)	Title	Source of Publication	Year
Cheung, S., Suen, H., and Cheung, K.	An automated partnering monitoring system-Partnering Temperature Index	Automation in Construction	2003
Yeomans, S., Bouchlaghem, N., and El-Hamalawi, A.	An evaluation of current collaborative prototyping practices within the AEC industry	Automation in Construction	2006
Yeung, J., Chan, A., Chan, D., and Li, L.	Development of a partnering performance index (PPI) for construction projects in Hong Kong: a Delphi Study	Automation in Construction	2007
Yeung, J., Chan, A., and Chan, D.	A computerized model of measuring and benchmarking the partnering performance of construction projects	Automation in Construction	2009
Carr, F., Hurtado, K., Lancaster, C., Markert, C., and Tucker, P.	Partnering in Construction: A Practical Guide to Project Success	Book	1999
Bennett, J., and Peace, S.	Partnering in the Construction Industry - A Code of Practice for Strategic Collaborative Working	Book	2006

Table 2 displays the number of AEC *partnering* studies resulting from data collection and screening, along with the publication source. From this data collection and screening evaluation it is evident that the bulk of *partnering* research has been in the *Journal of Management in Engineering* (JME-33), *International Journal of Project Management* (IJPM-26), *Construction Management and Economics* (CME-20), *Journal of Construction Management and Engineering* (JCME-14), *Engineering, Construction and Architectural Management* (ECAM-12), and *Proceedings of the Institute of Civil Engineers: Municipal Engineer* (PICE–ME-11). This notion is clearly shown on Table 2. Chou Kwong (1997) and Hong et al. (2012) both confirm how disparate findings gleaned from this table are best understood. As anticipated, top tier construction management journals hold the predominance of AEC *partnering* studies; whereas other sources only have limited *partnering* publications, many with only three or fewer.

Table 2: Partnering Publication Sources Identified in AEC Literature and Number of Studies.

Source of Publication	# of Studies	Source of Publication	# of Studies
Journal of Management in Engineering	33	Facilities	1
International Journal of Project Management	26	Habitat International	1
Construction Management and Economics	20	IEEE Transactions on Engineering Management	1
Journal of Construction Engineering and Management	14	Journal of American Water Works Association	1
Engineering, Construction and Architectural Management	12	Journal of Architectural Engineering	1
Proceedings of the Institute of Civil Engineers: Municipal Engineer	11	Journal of Civil Engineering and Management	1
Industry Report	9	Journal of Infrastructure Systems	1
Project Management Institute	9	Journal of Legal Affairs and Dispute Resolution in Engineering and Construction	1
Automation in Construction	4	Journal of Marine Science and Technology	1
Book	3	Journal of Professional Issues in Engineering Education and Practice	1
Building and Environment	3	Korean Society of Civil Engineering Journal of Civil Engineering	1
Journal of Purchasing & Supply Management	3	Lean Construction Journal	1
Proceedings of the Institute of Civil Engineers: Civil Engineer	3	Pipeline & Gas Journal	1
Business Ethics: A European Review	1	Procedia - Social and Behavioral Sciences	1
Construction Innovation	1	Research Policy	1
Cost Engineering	1	Road and Transport Research	1
Engineering Project Organization Journal	1	Supply Chain Management: An International Journal	1
European Journal of Purchasing & Supply Management	1	Thesis	1
Total	**173**		

3.4. Data Coding Criteria

This section gives a general description of the evaluation criteria established for this study. This data evaluation strategy initiated the meta-analytic approach followed in the research methodology.

3.4.1. Data Coding Form Development

According to Cooper et al. (2009) this criteria should be restrictive enough so as to allow homogeneous studies examining similar constructs using consistent methodological and procedural features. More importantly, the studies should be investigating the same topics and within similar contexts. For example, a study evaluating public / private partnerships is not the same as AEC partnering where construction project teams members and/or their organizations' work collaboratively to deliver construction projects. In this format, either project specific partnering or intraorganizational partnering is being considered.

The researcher followed common meta-analysis techniques to evaluate AEC partnering literature by: 1) Evaluating the data collected from search strategy identified in Chapter 3 and ensuring the study satisfies the litmus test for further inclusion in the data sample as a AEC partnering study; 2) The studies are sorted as empirical, anecdotal, book, dissertations, etc.; 3) Studies are coded according to the coding manual to analyze study characteristics; and 4) Empirical studies are coded according to identify their substantive characteristics for analysis.

To begin study selection, criteria are established to determine the eligibility of each study for meta-analysis. This criterion should be explicit in the research study population under

consideration for both analyzing and summarizing of their findings. General categories or items to consider when developing the data coding form are to determine if key distinguishing features are identified within each study namely: research respondent characteristics, key variables are represented, research methods and methodology, cultural and linguistic range, time frame, and publication type (Cooper et al., 2009; Lipsey & Wilson, 2001). In study selection methodology it is important to ensure a positive relationship exists between restrictive eligibility criteria and an extensive coding regimen including broader methodological and procedural features to improve validity of results. Additionally, methodological issues present within selected studies should be thoroughly explored to strengthen study design.

For this research a coding form is developed, shown in appendix B, using the constructs found in literature review. The coding form serves as the survey instrument in meta-analysis research and it is therefore imperative that care been taken in its design. As with surveys, the coding sheet must clearly elicit what is being measured and go through iterations to ensure it accurately accomplishes defined objectives and goals for the research (Cooper et al., 2009).

The coding form entailed 15 key codes that allowed the researcher to assign a code to characteristics and research design for each study identified during stage two of the meta-analysis. The 15 key codes are shown on Table 3 along with their descriptions.

Table 3: Partnering Key Codes used during Study Coding (Detailed Description provided in Appendix C)

Descriptions	Key Code	Descriptions	Key Code
Study ID	**ID**	Performance Outcome Constructs	**PEROUTC**
Type of Publication	**TYPPUB**	Project Performance Outcomes	**PPERFOUT**
Year of Publication	**PUBYR**	Organizational Performance	**OPERFOUT**
Key Publication Source in AEC Literature	**KEYPUB**	Survey Design	**SURVD**
Study Type	**STUTYP**	Number of Respondents	**NRESP**
Unit of Analysis	**UNITA**	Data Collection Method	**DATACM**
Partnering Type	**PARTYP**	Construction Industry Sector	**CONSEC**
Key Partnering Driver Constructs	**KPDC**	Country of Study	**COUN**

The items coded within each study are based on recommendations found meta-analysis literature and preliminary literature survey on AEC *partnering* (Cooper et al., 2009; Lipsey & Wilson, 2001). Coded items in this study provide information on the characteristics of the publication and study methodological characteristic. A coding manual is developed explaining the categories used on the coding form. The coding manual is given in appendix C. The key codes and coding manual are used to reduce error through orderly extraction of information from each report examined in this research.

The items collected from the coding forms were used in this study to delve into key study characteristics and substantive issues. The researcher entered coded data directly into an excel spreadsheet according to the established criteria on the coding form. From this, data evaluation

and analysis where conducted to construct a meta-analytic taxonomy on *key partnering drivers* and *performance outcomes* in AEC literature.

To enrich the information collected via the coding form, the taxonomy on *key partnering drivers* and *performance outcomes* are investigated using an analysis to link them to each construct. First, the constructs are obtained via AEC literature on *partnering* from the coding forms. Next, the items identified in the research are sorted in respective constructs based on AEC literature and agreements made through researcher collaborations with industry professionals and practitioners. Example placements for the following items are:

- Clear contracting language and form of contracts are used. (Planning / Procurement Oriented)
- Mutual goals and objectives are communicated to partnering participants. (Relationship Oriented)
- Continuous improvement workshops are used. (Process Oriented)

A full listing of this data sorting and analysis is provided in Appendices D, E, and F. The *key partnering driver* items are further investigated to understand their influence on the success of *partnering*. These are purported as having a positive or negative influence to successful *partnering*. Contrastingly, performance outcomes are inherently positive and are analyzed as such. A sample of this data analysis strategy for *key partnering drivers* is given on Table 4.

Table 4: Sample List of Key Partnering Driver Construct and Variables. (Full List provided in Appendix D)

PLANNING / PROCUREMENT	VARIABLE	RELATIONSHIP	# OF TIMES IDENTIFIED
Contract language and form of contract	PLAN06	+	12
Incentives / Fees / risk-reward/ gainshare-painshare	PLAN14	+	12
Financial security/stability	PLAN10	+	9
Poor understanding of the concept	PLAN29	-	9
Availability of resources	PLAN01	+	8
Partnering experience	PLAN27	+	8
Shared Equity	PLAN34	+	7
Contract size or appropriate project size	PLAN07	+	6
Good cultural fit	PLAN11	+	6
High cost to adopt partnering	PLAN12	-	6
Partnering agreement	PLAN26	+	6
Previous work experience with other members	PLAN30	+	6
Technical expertise	PLAN37	+	6
Clear and Compatible goals	PLAN03	+	4
Time required to develop	PLAN38	+	4

3.4.2. Data Quality and Validity

A common threat to the integrity and internal validity of a research synthesis is coder reliability (Cooper et al., 2009; Lipsey & Wilson, 2001). To control for intrarater reliability the researcher worked extensively with an experienced research synthesist to develop appropriate data collection methods. This helped to ensure that studies are systematically collected and coded for further analysis. A second approach to internal validity was to consult industry professionals and faculty with knowledge concerning AEC partnering to pilot test the coding criteria and identify key constructs. By doing so, confidence is afforded to the classification of studies and substantive study characteristics collected by the researcher; moreover, the coding form is refined as a result. And finally, a two month timeframe was allotted for the data collection, screening, coding stages of the research synthesis to help avoid coder drift. In addition, a

random sample of studies are recoded or double coded by the researcher to check for agreement rates between the coding results.

The Agreement Rate (AR) equation, a widely used index of interrater or intrarater (IRR) according to Cooper et al. (2009), is give as:

$$AR = \frac{number\ of\ observations\ agreed\ upon}{total\ number\ of\ observations}$$

In this study, the value of AR is computed as 0.945 when recoding is completed by the researcher for 10 percent of the studies coded during data evaluation and coding process.

External validity, as with any research method, is another important factor to account for within a research study. Threats to external validity can surface from publication bias or lack of random sampling within studies (Cooper et al., 2009). In this study external validity is largely unaddressed, due to the study characteristics in AEC literature and conceptualization in the research designs offered. Even still, key study characteristics such as source of publication is coded and discussed to help readers understand the generalizability of findings from this research synthesis.

3.5. Hypothesis for Partnering Framework

The research will analyze a hypothesis based on the data under consideration in this study. A Chi-Square test (X^2) is conducted to understand the proposed *partnering* taxonomy where the observed values are the number of times the variables are counted within each of the study findings under investigation and tested against the expected values. In lieu of a qualitative

analysis utilized to summarize findings resulting from all research investigated in this stream of literature, a preliminary quantitative analysis is used to explore the following null hypothesis:

- *H_0 = There no is difference between observed and expected values of both key partnering drivers and performance outcomes found in AEC literature.*

3.6. Interpreting Results and Discussion

The final stage of this research is dedicated to the presentation of findings and to then discuss the results. This study reports the findings using descriptive statistics on study characteristics such as type of publication, year of publication, etc. The results are collected through two overlapping data sets being 173 studies to capture the broad base of AEC *partnering* literature study characteristics. Key study characteristics are accessed through this data offering direction and insight as to the depth and breadth of *partnering* research in AEC literature.

The second data set consists of 74 studies or 43% of all AEC *partnering* literature. These key studies focus in on substantive issues integral to this study. These are, then, explored by statistical analyses on substantive study characteristics, for example, *partnering* type, *key partnering driver* construct, and *performance outcome* construct as a result of data evaluation and analysis. Implications of research findings are discussed in Chapter 6, along with limitations and direction for future research.

3.7. Summary

In summary, Chapter 3 emphasizes the goals and objectives of this research and introduces the research methodology that is followed. A meta-analytic approach is used for research design being: construct identification, data collection and screening, coding form development, and data evaluation stemming from AEC literature investigating *partnering*. The next Chapter directs attention to the taxonomy on this stream of literature. From this, data analysis techniques which are found in meta-analytic research are used in Chapter 5 to ensure quality and to present findings on *key partnering drivers* and *performance outcomes*.

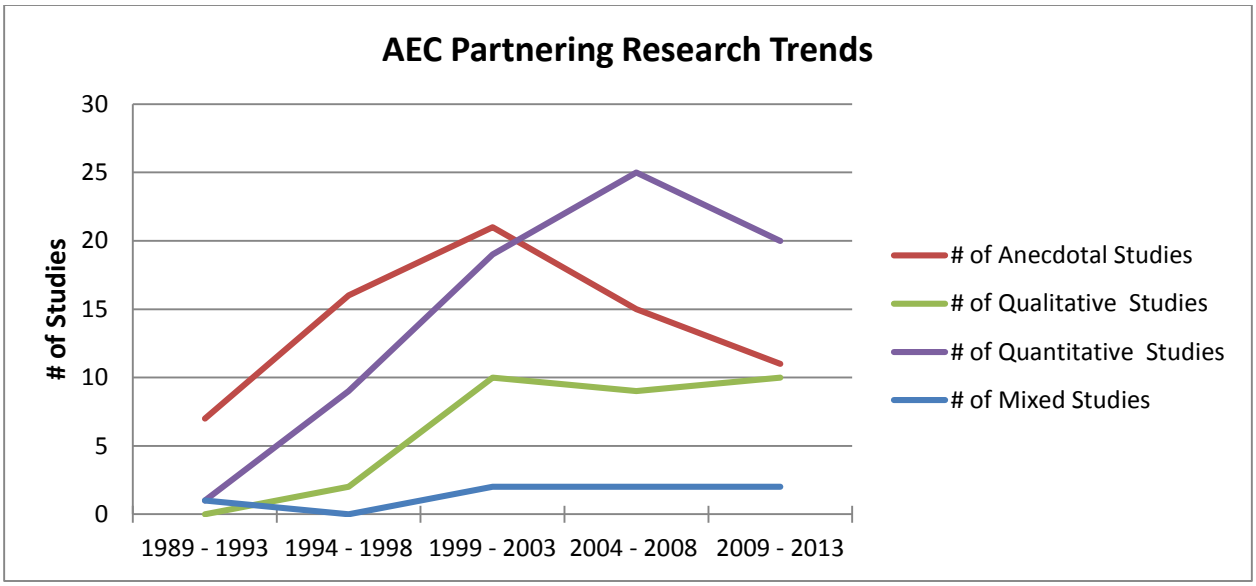
CHAPTER 4 FINDINGS

This chapter presents a research synthesis evaluating AEC *partnering* study characteristics and other substantive study features are presented using both a qualitative and quantitative approach. Then, details of the *partnering* taxonomy developed from *partnering* constructs are given. Lastly, a *partnering* framework developed as a result of this study

4.1. Research Synthesis of Partnering Study Characteristics

This study examined *key partnering drivers* and prominent links between *performance outcomes* from 25 years of research purported in AEC *partnering* literature. A meta-analytic approach was conducted and suggests several key findings. The researcher utilized the information obtained from data analysis and evaluation on the key characteristics within the broader spectrum of AEC *partnering* literature. Meaning, 173 studies are used to report the background on this stream of literature. The following sections will focus attention on study characteristics found within the literature.

As a result of this research synthesis, this study presents several key features related to AEC partnering literature. First, the initiation of partnering purportedly commences with the Construction Industry Institute (CII) Partnering Task Force research aiming to establish consistency as it relates to *partnering* in construction, along with guidelines on process implementation and anticipated benefits (CII, 1989). Based on the trends shown on Figure 5, *partnering* research experienced rapid growth for a 10 year period reaching its crescendo around the year 1999 with empirical studies.



For interpretation of the references to color in this and all other figures, the reader is referred to the electronic version of this thesis.

Figure 3: AEC Partnering Research Trends shown in Five Year Periods.

Contrastingly, anecdotal research continued its ascension for approximately another five years thereafter. Surprisingly, the preponderance of AEC *partnering* research appears to be stalling based upon the evidence. This, perhaps, illuminates another approach is warranted to continue investigating the practically of *partnering* and implications on *performance outcomes* through more industry based research with more sophisticated metrics to interpret findings.

Based on findings from this research synthesis, Figure 6 is given showing the aggregation of partnering studies over the past 25 years of research. Over the first two periods *partnering* research nearly tripled. The researcher further posits this growth may be attributable to the Latham Report (1994) put forward in the UK, presenting a direction for researchers in this region regarding ways to improve ethics and trust performance in the UK construction industry (Wood, McDermott, & Swan, 2002; Khalfan, McDermott, & Swan, 1996). They credit the

Latham Report with guidance on their investigations to shed light on trust issues. Khalfan et al. (1996) further suggest these issues originate from the complexities of the construction industry and its associated fragmentation across organizations and projects.

Subsequently, research only doubles from 1998 to 2003 and remains relatively consistent from the period of 2003 to 2008. Then, as previously mentioned, research trends begin declining. Partnering research appears to have reached a saturation point, to which is confirmed by this downward trend.

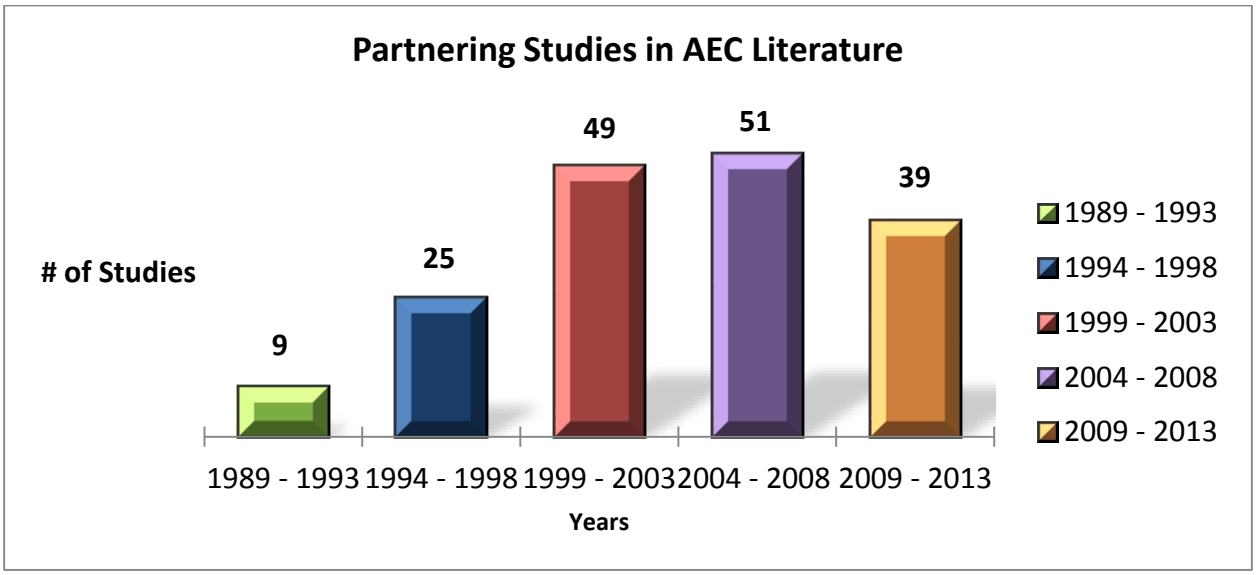


Figure 4: Partnering Studies in AEC Literature shown by Five Year Periods.

The second feature resulting from this synthesis was the type of publications in which AEC literature on partnering resides (i.e., journal, thesis or dissertation, industry report, conference proceedings, or unpublished manuscripts). Study findings show AEC partnering literature is most prominent within journal publications (160) and industry reports (9). Seventy four percent

(74%) of the studies are found within key publication sources (i.e., *Journal of Management in Engineering*, *International Journal of Project Management*, *Construction Management and Economics*, *Journal of Construction Management and Engineering*, *Engineering*, *Construction and Architectural Management*, and *Proceedings of the Institute of Civil Engineers: Municipal Engineer*). Results did not produce any studies or literature resulting from conference proceedings or unpublished manuscript, however, a thesis on partnering and three book sources were accounted for. This is an interesting finding, as many research projects in academic literature stem from thesis or dissertations. As such, it was anticipated that many more AEC partnering studies would exists in this category.

Study type (i.e., quantitative, qualitative, mixed, or anecdotal) was another finding related to AEC partnering research characteristics in which this study determined. As shown on Figure 7, *partnering* studies are predominantly empirical and quantitative in study methodology and results. Of 173 *partnering* studies found within the literature results show: 70-anecdotal, 64-quantitative, 31-qualitative and 8-mixed methods.

The findings from Figure 7, also purports a large number of anecdotal studies exists in AEC *partnering* literature. This category includes studies that are not empirically derived or are found in books and other publications that lack scholarly research rigors required for most of the other studies. Despite this concern, the researcher utilizes this group of studies to help provide direction and guide future partnering research.

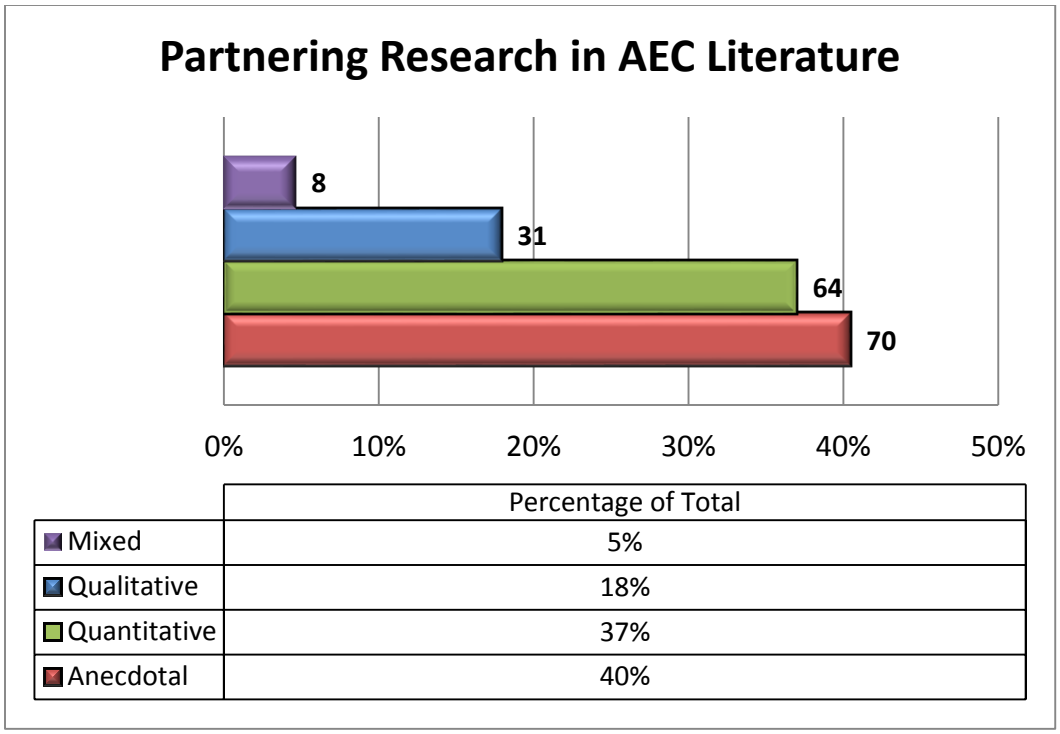


Figure 5: Partnering Research in AEC Literature by Study Type and Number of Studies.

When focusing on the empirical research findings involving AEC *partnering* the portion of quantitative studies becomes more evident. From this, it is clear that many researchers are taking advantage of quantitative methods to understand *partnering*; thus, when anecdotal studies are not accounted almost two-thirds of empirical *partnering* research is quantitative in methodology and findings. As such, a potential gap is presented for additional studies focused on underlying sociological constructs developed during *partnering.* These originate from organizational theory and are often alluded to by other researchers which are more conducive to qualitative or mixed method approaches (Bresnen, 2009; Bresnen, 2007; Bresnen, Goussevskaia, & Swan, 2005).

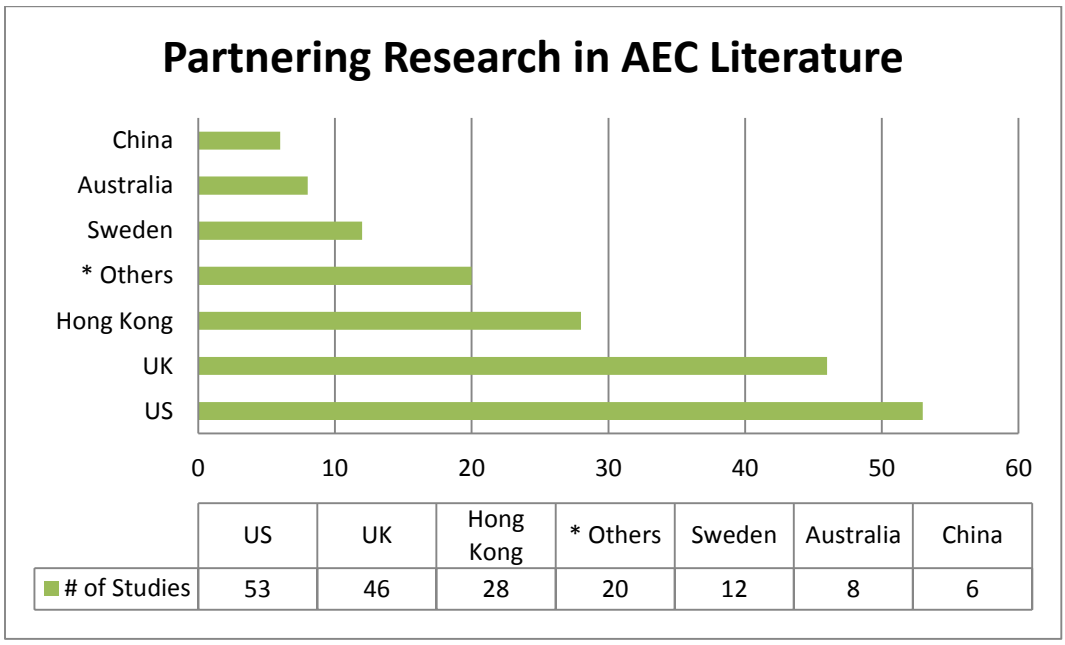
The unit of analysis utilized by researchers investigating *partnering* was forty two percent (42%) at individual partnered project level, while the majority examined interorganizational partnering or fifty eight percent (58%) of the studies. This finding exclaims that researcher realize the need to understand the organizational dynamics found within *partnering* more than the project level investigation. Although, research remains rather stagnate as to the advantages offered to project level performance which is difficult to infer benefits which are directly attributed to *partnering.*

The types of *partnering* investigated ranged from single project partnering, long-term organizational partnering, or general partnering when the type is not identifiable. Forty six percent (46%) of the studies found in AEC *partnering* literature looked at single project partnering, long-term organizational partnering was found in fifteen percent (15%) of the studies, and twenty eight percent (28%) of the studies did not directly mention the type of *partnering*. Meanwhile, one study examined *partnering* from both perspectives.

Results related to construction industry sector where not consistently reported or where difficult to determine the appropriate sector; however, it is worth noting that forty five percent (45%) of the studies did not attempt to specify the construction industry sector. Therefore, future researchers may rethink the reporting related to this information in efforts to provide greater direction to both academics and practitioners.

Another interesting findings resulting from this research synthesis within study characteristics is illuminated by the country in which the studies originated. This is shown on Figure 8, which

groups several countries where few studies were reported. According to the findings, the United States (US) produced the bulk of *partnering* studies (51); meanwhile, the United Kingdom (UK) follows with (49). The countries of origin are determined in one of two methods being: 1) country is clearly elicited within the study and is identified as such, or 2) when country is not clearly communicated in the study, the country is assigned by the researcher as first authors' country.



* Others: Singapore (3), Finland (1), India (1), Japan (1), Taiwan (2), Norway (1), Chile (1), Poland (1), Netherlands (2), Vietnam (1), Malaysia (1), Korea (2), Puerto Rico (1), Spain (1), New Zealand (1).

Figure 6: Partnering Research in AEC Literature shown by Country.

From Figure 8, it is also clear that several other countries are lagging behind with *partnering* research. Although this is true, many of these countries are now beginning to conduct more research in this area as evinced in Figure 9. This figure, also, shows initial AEC *partnering*

research starting in the United States (US) from 1989 - 1993, with a drastic increase the following period. During this same time period from 1994 - 1998 the United Kingdom (UK) and Hong Kong both experience their initial starts in AEC *partnering* research. Interestingly, a transition occurs in research trends by country from 1999 - 2003 where both the US and UK begin to show declines in number of *partnering* studies; whereas, other countries continue to see growth until 2009.

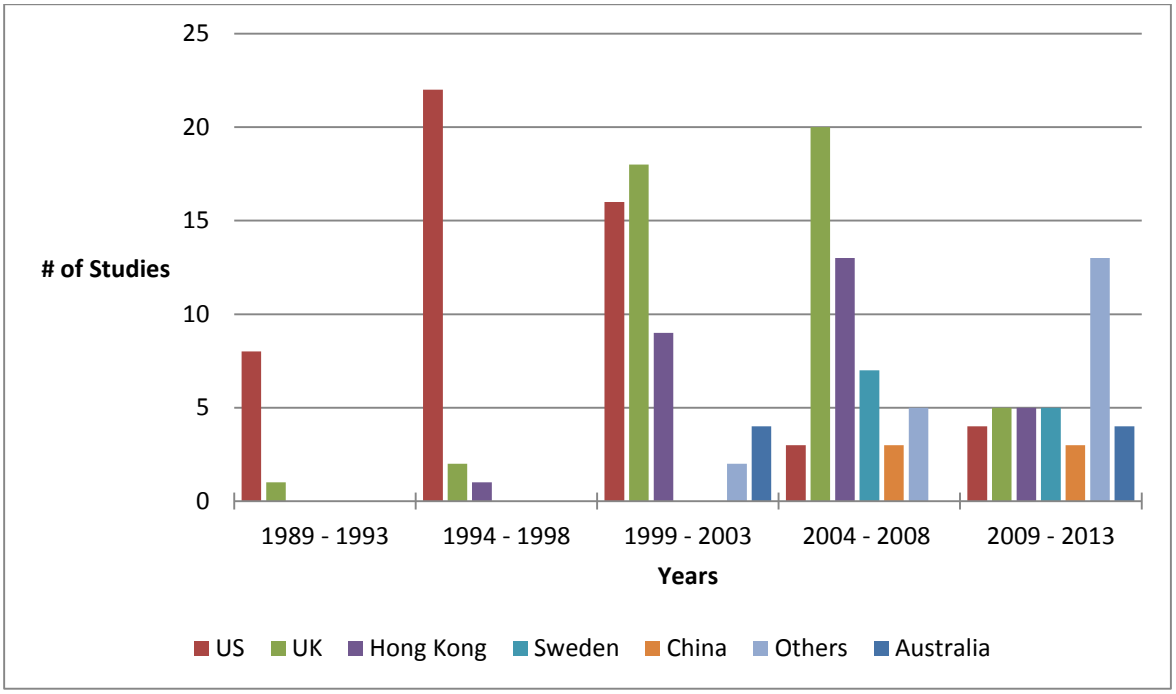


Figure 7: Partnering Studies by Country and Five Year Period.

Next a brief summary of three other study characteristics is given. The studies included in this portion of the analysis are reduced to 71. This is particularly important because these studies directly investigate similar constructs which are aggregated in this synthesis to derive the

taxonomy of AEC *partnering* literature. The next section directs attention to these substantive study characteristics extracted through the coding criteria and results thereof.

4.2. Research Synthesis of Partnering Drivers and Consequences

This section presents findings associated with *key partnering drivers* and *performance outcomes* as a result of this research synthesis. A quantitative approach is used to explore links between the constructs included in the taxonomy of AEC *partnering* literature. To illuminate findings descriptive statistics are reported.

The three primary *partnering* categories and nine subsequent constructs are shown in Table 5. This table illuminates the pervasive variables identified within AEC literature investigating *partnering*. These are the results of 71 studies investigating similar substantive issues. The mean number of items provided by each study was 13 items, while the median was 12. Process oriented variables are most frequently purported in AEC literature (i.e., 274 variables identified by 55 studies), while planning and procurement related variables occurred second most frequently in AEC literature (i.e., 160 variables identified by 55 studies). Meanwhile, 23 variables classified as external moderators attenuating the effect of *key partnering drivers* on partnering project success. In sum, 939 variables are purported within partnering literature of which 566 are categorized as *key partnering drivers* and 350 variables are performance consequences or outcomes.

Table 5: Partnering Constructs and Variables in AEC Literature.

	Constructs	# of Times Variables Identified	# of Studies
Key Partnering Drivers	Process Oriented	274	55
	Planning / Procurement Oriented	160	55
	Relationship Oriented	132	48
External Moderator	Public Sector Sentiment	23	8
Project Performance Outcomes	Cost Performance	71	29
	Schedule Performance	40	29
	Quality / Safety Performance	59	27
	Dispute / Litigation Performance	32	21
Organizational Performance Outcomes	Intraorganizational Performance	78	27
	Process Related Performance	70	27

This research synthesis produced the following ranking of key items found within the taxonomy on AEC *partnering* literature. The top three items most frequently identified by the literature are presented on Table 6.

Table 6: Top Three Attributes for Each Partnering Construct in AEC Literature.

	Constructs	Key Attributes	# of Times Identified
Key Partnering Drivers	Planning / Procurement Oriented	*Clear contracting language and form of contract used; Incentives, feeds, risk-reward, or gainshare-painshare arrangements used.	12
		Organizations have financial security and stability to support process.	9
		*Poor understanding of the concept; Availability of resources	8
	Relationship Oriented	Mutual trust is established for interorganizational project team.	21
		Mutual goals and objectives are communicated to partnering participants.	14
		Strong team commitment.	12
	Process Oriented	Top management commitment and support.	20
		Effective and open communication or dialogue within the interorganizational project team.	16
		Continuous improvement workshops are used.	14
External Moderator	Public Sector Sentiment	Bureaucratic public client organizations inhibit partnering implementation.	6
		Stringent public rules, regulations and laws discourage partnering implementation such as competitive bidding.	4
		Conservative industry culture inhibits partnering approach where status quo is strongly supported.	3

***** Key attributes equally identified within AEC partnering studies.

Table 6 (Cont'd): Top Three Attributes for Each Partnering Construct in AEC Literature.

	Constructs	Key Attributes	# of Times Identified
Project Performance Outcomes	Cost Performance	Meeting budgeted costs targets for the project.	10
		Cost savings are achieved on the project.	7
		Reduces additional project expenses resulting from changes.	6
	Schedule Performance	Meeting schedule targets for the project.	12
		Reduces time in delivery the project.	6
		Better productivity for project teams.	5
	Quality / Safety Performance	Improves the overall quality of the project.	14
		*Environmental issue complaints; *Reduces the amount of wasted work or rework; *Increases client satisfaction.	5
		Improve designs for the project.	4
	Dispute / Litigation Performance	Reduces number of disputes associated with the project.	10
		*Reduces litigation associated with the project; Effective claims and issue resolution process;	7
		*Improved conflict resolution strategies; Reduced exposure to risks.	3
Organizational Performance Outcomes	Process Related Performance	Improved relationship for interorganizational project team.	16
		Long-term trust established for interorganizational project team.	10
		Improved communication for interorganizational project team.	9
	Intraorganizational Performance	Improved profit margins.	8
		*Enhances organization's reputation in the industry; Improved corporate culture.	7
		Opportunity to continuously access new projects based on healthy relationships and experience.	6

***** Key attributes equally identified within AEC partnering studies.

The number of items varied by construct, for example, *external moderators* had the fewest number of items (10). Contrastingly, the *process oriented* category held the greatest proportion of *partnering* variables assigned to any category (72). The proposed taxonomies are shown on

Table 8, including; (1) number of items or variables assigned to each construct; (2) number of times the variables are identified within all studies combined; and (3), number of studies investigating the constructs. A complete list of the items identified in literature can be found in the appendices. The number of items listed in each of the constructs and number of times variables identified reported on Table 7, are then used in data analysis to calculate expected values for the Chi-Square test in the next section.

Table 7: Taxonomy of Partnering in AEC Literature.

	Constructs	# of Items	# of Times Variables Identified	# of Studies
Key Partnering Drivers	Process Oriented	72	274	55
	Relationship Oriented	33	132	48
	Planning / Procurement Oriented	38	160	55
External Moderator	Public Sector Sentiment	10	10	23
Project Performance Outcomes	Cost Performance	23	71	29
	Quality / Safety Performance	20	59	27
	Schedule Performance	11	40	29
	Dispute / Litigation Performance	7	32	21
Organizational Performance Outcomes	Intraorganizational Performance	26	78	27
	Process Related Performance	20	70	27

The results from both Table 6 and Table 7 also give several key findings that are worth noting. First, *key partnering drivers* received the highest number of studies (55) reporting on the associated constructs. In addition, it is clearly evident that *process oriented* attributes of *partnering* are most important to perpetuate successful *partnering* according to AEC literature. This means procedural aspects such as continuing to gain support of top management, ensuring

effective lines of communication exists among interorganizational project team members, and continuous improvement workshops may help reinforce the *partnering* process. A second key finding relates to *cost performance* at the project level. The evidence shows that cost implications are improved through *partnering* based on the number of times the variables are identified in literature. Within the *cost performance* construct meeting project budgets and costs savings are offered through *partnering*, as Table 8 also indicated. Other costs are also reduced, in particular those associated with changes on the project. At the organizational level of analysis the results were closely split between *process related* and *intraorganizational performance*. For example, 27 studies captured variables found in *organizational performance outcomes* with 70 and 78, respectively situated in each construct. Key findings for *process related performance* are associated with interorganizational team performance such as improving relationships, building long-term trust, and communication. Meanwhile, *partnering* is reported as beneficial to organizations' profitability, corporate culture, and enhances their reputation in the industry.

Statistical analysis for this study is given next to further elucidate findings as a result of hypothesis testing.

4.2.1. Statistical Analysis of Key Partnering Drivers and Performance Outcomes

To learn the associations of variables a Chi-Square test (X^2) is conducted where the observed values are the number of times the variables are counted within each of the study findings under investigation and tested against the expected values. This test is completed to learn the significance level of the relationships between *key partnering drivers* and project partnering

success. In addition, the test helped to validate the proposed taxonomy on *partnering* and its associated constructs and the categorization of items or variables based on AEC literature.

The following null hypothesis and alternative hypothesis are used to examine the taxonomy of partnering:

- *H_0 = There is no difference between observed and expected values of both key partnering drivers and performance outcomes found in AEC literature.*
- *H_1 = There is a significant difference between observed and expected values of both key partnering drivers and performance outcomes found in AEC literature.*

A Chi-Square test (X^2) is used in final analysis to examine *key partnering drivers* and *performance outcomes.* Expected values for *key partnering drivers* are calculated as:

$$\frac{\sum Observed\ key\ partnering\ driver\ column\ * \sum Observed\ key\ partnering\ driver\ row}{\sum All\ observed\ key\ partnering\ drivers}$$

Results from this analysis relating to *key partnering drivers* are given on Table 8. An example calculation for expected value of the relationship (Yes) cell is calculated as:

$$\frac{160 * 491}{566} = 138.799$$

The information in the observed section of the table displays the number of times variables are posited as having a positive relationship on partnering success within studies. These counts are reported in the (Yes) row. If variables within each study are negatively associated with successful partnering it was reported in the (No) row. A table showing this full coding for each

variable is shown in the appendices. A brief snapshot is given on Table 10, along with an explanation on the strategy followed during analysis.

Based on the results shown on Table 8, the taxonomy of *key partnering drivers* is a valid categorization of the variables found in AEC literature (i.e., P≤.05; 0.0035). Meaning, there is a significant difference between the observed and expected values produced from the research synthesis and subsequent categorization. From this it is suggested that the exploratory taxonomy of *key partnering drivers* is not as a result of chance or randomization. In addition, a level of dependency exists between those who feel partnering success hinges on the respective *key partnering driver* categories.

Table 8: Key Partnering Driver Category Validation

Observed Key Partnering Drivers					**Expected Key Partnering Drivers**		
	Planning/ Procurement	Relationship	Process	Total	Planning/ Procurement	Relationship	Process
Yes	128	113	250	491	138.799	114.509	237.693
No	32	19	24	75	21.201	17.491	36.307
Total	160	132	274	566			

P≤.05; 0.0035

To reach aforementioned results on *key partnering drivers* the researcher assigned values to each variable within studies. The values are classified using a strategy to determine if the variable has a positive (+) or negative (-) association with *partnering* success. For instance,

purported incompatible project type (e.g., public sector, private sector) to implore the benefits of *partnering* on a project runs counter to its overall success. In a similar manner, including incentives or risk-reward arrangements for the project participants is seen as beneficial to *partnering* success.

Table 9 displays similar results regarding observed *performance outcomes* situated in *project performance* and *organizational performance*. Expected values are arrived at using a slight variation in computation, in part, because performance outcomes are commonly reported with a neutral or positive connotation. Based on the results, again, it shows that the taxonomy related to *performance outcomes* found in AEC partnering literature is appropriately categorized. The Chi-square test provides that observed values obtained from the literature are significantly different when compared to expected values, and therefore, are far from chance in the classification of *partnering performance outcomes* (i.e., P≤.05; 1.8149E-40).

Table 9: Performance Outcomes Categorization Validation

Observed and Expected Performance Outcomes		
	Project Performance	Organizational Performance
Observed	202	148
Expected	115.159	63.626

P≤.05; 1.8149E-40

The observed and expected values presented on Table 9 are arrived at through results provided on Table 10. This table, which is found in the appendices, previews the results of coding for

performance outcome variables. Results from Table 10 are then used to compute expected values. A sample calculation is given next.

Table 10: Snapshot of Performance Outcome Constructs and Variables (Full List provided in Appendix F).

SCHEDULE PERFORMANCE	VARIABLE	TOTAL
Meeting schedule targets	SCHP6	12
Reduce time in delivering the project	SCHP9	6
Better productivity	SCHP1	5
Project schedule growth	SCHP8	4
Time variance	SCHP11	3
Improved construction time	SCHP2	2
Integrated solutions to improve efficiency	SCHP4	2
Liquidated damage percent of total contract days	SCHP5	2
Percent of additional days granted	SCHP7	2
Improved productivity	SCHP3	1
Time	SCHP10	1
TOTAL		**40**

To compute the expected value for project performance variables, first, the researcher combined all the observed variables found in the literature being 202 (i.e., 71 – cost performance, 40 – schedule performance, 59 – quality and safety performance, and 32 – dispute and litigation performance). Second, the following formula is used:

$$\frac{\sum All\ observed\ performance\ outcome\ variables * \sum Available\ perfomance\ outcome\ variables}{\sum All\ Available\ performance\ outcome\ variables}$$

The numbers of available project performance variables for each construct are: 23 – cost performance, 11 – schedule performance, 20 – quality and safety performance, and 7 – dispute and litigation performance. Additionally, the numbers of available organizational performance variables are: 20 – process performance and 26 – intraorganizational performance. The overall total number of available performance outcome variables equals 107. An example calculation

to determine the expected value for the project performance outcome category is entered as such:

$$\frac{202 * 61}{107} = 115.159$$

The full listing of available variables used for the project performance analysis is shown in the appendices.

4.3. Partnering Construct Development and Taxonomy

From the initial analysis conducted at stage one, being construct identification, the following constructs were formulated the guide to the research. There were three major categories from which these were found being*: key partnering drivers, project performance outcomes*, *and organizational performance*. The following Table 11 shows the initial taxonomy of partnering constructs. The table also gives definitions for each construct to which establishes the criteria for inclusion of specific variables identified within each study. The table identifies the construct categories as: *key partnering drivers*, *project performance outcomes*, and *organizational performance*. The major categories are further segmented into nine different constructs that are used to build the *partnering* taxonomy.

Table 11: Taxonomy of Partnering Constructs and Associated Definition.

	Constructs	Definitions
Key Partnering Drivers	Planning / Procurement Oriented	Important attributes identified early on in the decision making process when potential project participants decide to pursue partnering.
	Relationship Oriented	Important attributes found during relationship management occurring within interorganizational project teams.
	Process Oriented	Important attributes occurring during the partnering process necessary to ensure the efficacy of partnering process.
External Moderator	Public Sector Sentiment	Important public sector concerns attenuating the success of partnering process.
Project Performance Outcomes	Cost Performance	Those cost improvement outcomes attributed to partnering process evaluated after project completion.
	Schedule Performance	Those project schedule improvement outcomes attributed to partnering process evaluated after project completion.
	Quality / Safety Performance	Those project quality and safety related outcomes attributed to partnering process evaluated after project completion.
	Dispute / Litigation Performance	Those project dispute and litigation improvements attributed to partnering process evaluated after project completion.
Organizational Performance Outcomes	Process Related Performance	Process related improvements in interorganizational team collaboration learned through partnering process and available for feedback into process.
	Intraorganizational Performance	Intraorganizational related outcomes beneficial to long term organizational success evaluated after project completion.

4.3.1. Key Partnering Driver Construct Development

As organizations set out to pursue *partnering* they will typically employ a strategy to determine its applicability for the project. Several variables nested within *key partnering drivers* are

frequently posited to ensure effective planning and procurement and are therefore categorized as such. CII (1989) and Black et al., (2000) suggest establishing and maintaining shared performance goals and objectives, ensuring partner organizations are properly aligned, and having the necessary technical expertise and resources to implement partnering are key planning and procurement attributes. Other subordinate variables under KPD are relationship oriented and are considered prior to and during the partnering implementation stages. Some of these relationship oriented aspects are identified as mutual trust, top management commitment, and win-win team philosophy which are explored from the perspective of *partnering* participants'. Additionally, it is important that procedural or process oriented drivers are appropriately accounted for to learn key implementation variables, the last subordinate category to KPD. These three distinct categories are discussed next.

Planning and procurement oriented refers to those variables identified early on in the decision making process when potential project participants are deciding to pursue partnering. *Partnering* planning and procurement oriented attributes present in AEC literature are categorized as key drivers of partnering in this research. Many organizations and potential partnering participants approach partnering planning and procurement systematically. This means, prior to organizations setting out to establish a partnered project they evaluate the merit for partnering based on several criteria. Some of these key attributes or questions identified in the literature are (Bresnen, 2010; Bresnen, 2009; Yeung et al., 2009; Eriksson & Pesamaa, 2007; Chan et al., 2006; Wong et al., 2005; Gladola & Sheedy, 2002; Ng et al., 2002; Rogge et al., 2002; Black et al, 2000; Grajek et al., 2000):

- *Is the project the right size for partnering (i.e., > $5 million)?*
- *Does the contracting language clearly include partnering?*
- *What form of contract or project delivery method will be used?*
- *What is the anticipated project duration?*
- *Will there be a joint project charter established for the project (i.e., formal document signed by partnering parties outlining joint collaboration principles established during the initial workshop)?*
- *Should the project partnering participants use a partnering agreement?*
- *Do the partnering participants have the necessary technical expertise to develop partnering?*
- *Should the partnering project include incentives, risk-reward, or gainshare-painshare arrangements?*
- *Do participants have any previous partnering experience?*
- *How well do participants understand the partnering concept?*

Many of these questions owners, contractors, and designers will consider and must answer prior to forming a partnership to help ensure the project aligns with intraorganizational goals and objectives.

Relationship oriented refers to key variables found during the *partnering* life-cycle to improve relationships and enhance relationship management within interorganizational project teams. One frequently posited variable is mutual trust within the project team members throughout the entire *partnering* process. Thus, relationships are predicated on trust which formulates the

initial building blocks for the rest of the dealing in terms of communication and information exchanges. Several other KPD extracted from AEC literature shows mutual goals and objectives that are clearly communicated to the project team and garnering team members' commitment to the entire *partnering* process are essential during all stages of *partnering*. In addition to clear goals and objectives, project team members should feel equally empowered to offer innovative ideas or solutions when problems are encountered during project execution (Hughes, Williams, & Ren, 2012; Yeung et al., 2009; Tang, Shen, & Cheng, 2006; Chan et al., 2004; Chan et al., 2003; Ng et al., 2002; Akintoye et al., 2000).

Process oriented refers to identified variables occurring during partnering implementation process necessary to ensure the efficacy of partnering process. After organizations decide to pursue *partnering*, a professional facilitator leads a workshop which establishes the *partnering* relationship for the participants. During the workshop decision-making processes and performance improvement metrics are discussed by the project team. Other KPD included in the *partnering* process oriented phase are: top management commitment and support during implementation, open and effective communication among project participants, and early involvement of designer, contractor, and subcontractors in *partnering* process, developing a dispute resolution process, and joint project office with shared information technology tools are utilized (Lahdenpera, 2012; Manley et al. 2012; Eriksson, 2010; Chan et al. 2006; Nystrom, 2005). Other effective KPD purported are continuous training and frequent partnering meetings where feedback is provided to the team for continuous improvement efforts (Cheung et al.,

2003; Rogge et al., 2002; Cheng et al., 2000). While working through partnering implementation process it is, also, imperative that relationships are appropriately managed and strengthened.

Although the categories are mutually exclusive, the attributes are realized across various stages of the construction process. For example, during project initiation and conceptual design partnering participants have decided to pursue partnering and start outlining the joint partnering charter, while also working with other project team members representing the owner, client, designers, and main contractors to select subcontractors and vendors. At this junction they are also establishing mutual trust and setting the goals and objectives for the projects, which are relationship attributes. Figure 4 displays the six stages of a construction projects and depicts how *key performance attributes* and *performance outcomes* are related. The schematic design and design development stages are where relationship and process oriented attributes are starting to become more focused, especially as the project approaches the construction phase. From here, project characteristics and performance outcomes start to take shape allowing project partnering stakeholders to learn from the overall construction process how *partnering* impacts *performance outcomes*. The *performance outcomes* are classified as project, process, or organizational performance and are discussed next.

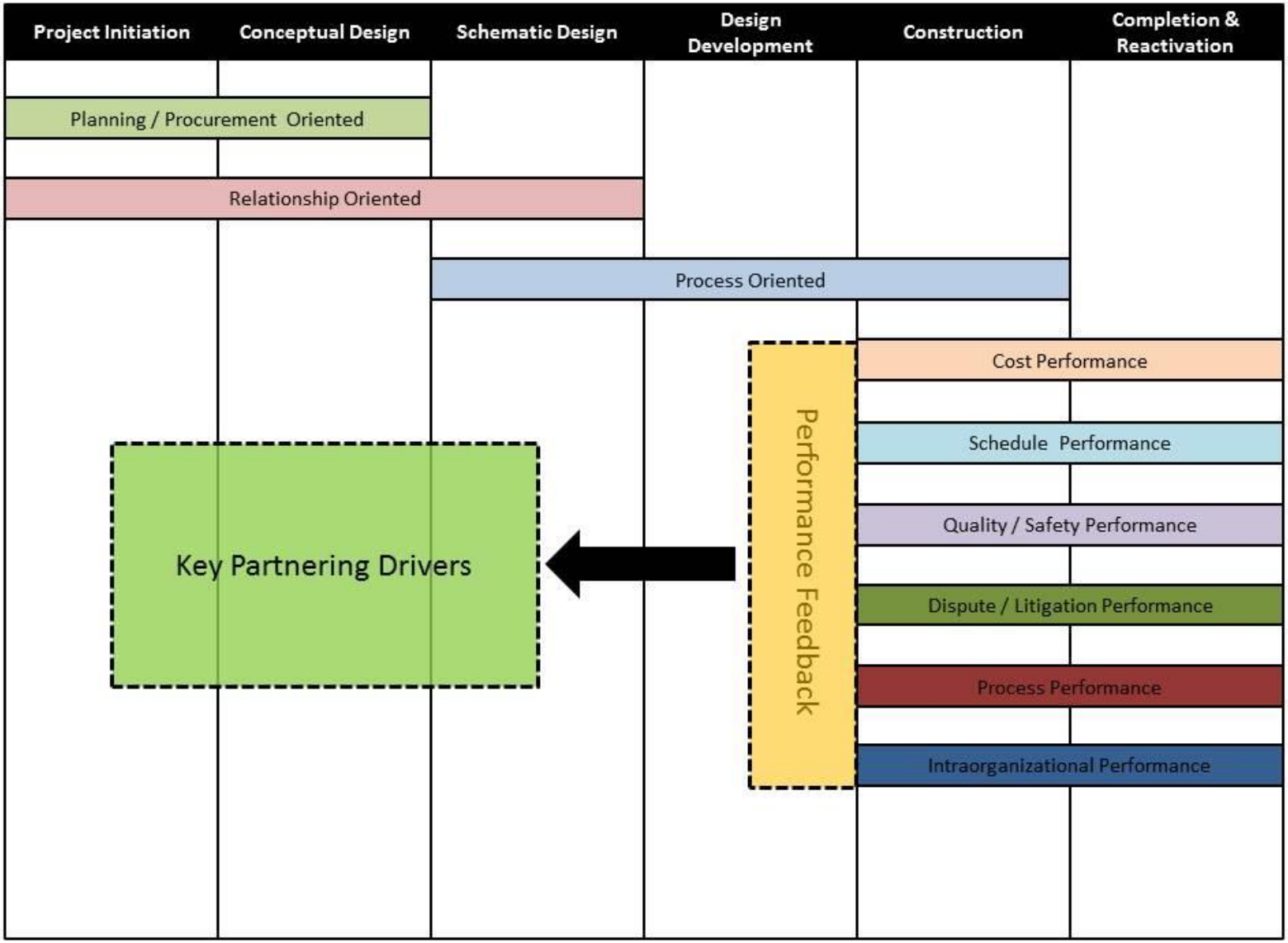


Figure 8: Stages of Construction Partnering and Associated Constructs.

4.3.2. Performance Outcome Construct Development

AEC literature maintains successful partnering projects are beneficial to improve performance at several dimensions. To examine performance implications literature points to certain useful metrics found in the three distinct dimensions. These dimensions are *project performance*, *process performance*, and *intraorganizational performance*.

Performances at the project level are separated as: cost performance, schedule performance, quality/safety performance, and finally dispute/litigation performance. These areas are common reported in AEC literature as critical measure and outcomes that should be evaluated to ascertain whether a project is successful.

Cost performance is related to those cost improvement outcomes attributed to partnering identified during partnering implementation and evaluated at project completion. To learn and analyze cost benefits attributable to *partnering*, researchers utilize objective metrics such as cost growth (i.e., change in contract amount in respect to original contract amount), average cost per change orders (i.e., change in contract amount in respect to number of change orders), and schedule growth among others (Gransberg et al., 1999). The aforementioned objectives metrics, though not exhaustive, are used to report project performance goals and objectives. From this, some researchers and partnering participants utilize this project level performance information to compare partnered versus non-partnered project outcomes (Grajek et al., 2000; Gransberg et al., 1999; Weston et al., 1993).

Schedule performance is related to outcomes associated with improved project durations which are ascribed to *partnering* process evaluated at project completion. For example, *partnering* is believed to reduce the overall project delivery time, while also helping the project team members meet predetermined schedule milestones or target dates (Anderson & Polkinghorn, 2011; Doloi, 2009; Larson, 1995). In the meanwhile *partnering* is also credited with reducing the number of liquidated damages per total contract days, controlling project schedule growth, and improving both productivity and efficiency within the project (Ling, Ong, Ke, Wang, & Zou, 2014; Lu & Yan, 2007; Gransberg et al., 1999; Gransberg et al., 1998).

Quality and safety performance is related to outcomes involving project safety improvements and design quality shown to reduce waste and inefficiencies during partnering process evaluated at project completion. The quality of construction documents and designs are improved through greater collaboration from all parties early on in the conceptual and design development stages of a project. During the early phases of the construction process bringing in contractors can assist in value engineering and constructability concerns which are shown to have a positive impact on both cost and schedule performance (CII, 1991). Therefore, project delivery arrangements such as *partnering* can assist efforts to boost quality. Often times the quality of the project is based upon client or end-users' satisfaction levels, however, other noticeable improvements resulting from quality design are fewer environmental complaints, reduced wasted work, or having to do rework; More importantly *partnering* projects are thought to provide a safer environment for workers because there is a higher performance expectation for the project, which fosters better safety awareness among all project team

members. This goes hand in hand with goals and objectives for both the project team and organizations involved.

Dispute and litigation performance outcomes refer to the reduction of disputes and litigation attributed to *partnering* process resulting in better claims and issue resolutions. The bedrock of *partnering* from its inception has been to minimize disputes and litigation within the construction industry due to the competitive nature of business fueled by high financial risks (CII, 1991). *Partnering*, as such attempts to assuage those concerns by creating systems to deal with claims and issues intent on minimizing disputes which lead to litigation (Bayliss et al., 2004; Chan et al., 2003; Gransberg et al., 1999).

Certain performance aspects are typically defined as soft measures and are frequently purported using subjective data gained through partnering participants' experience (Cheung et al., 2003). The two types of *organizational performance outcomes* are *process performance* and *intraorganizational performance*, although organizational performance may also be understood through both subjective and objective data.

Process performance is related to improvements in interorganizational team collaboration learned through *partnering* process available for feedback into all stages of process. For example Black et al. (2000) and Chan et al. (2003) exclaim less adversarial relationships, improved administration processes, better communications among participants, and long-term relationships solidified by trust are offered as some of the anticipated process performance advantages. These are categorized, again, as process performance attributes because they can

be recycled back into partnering implementation as feedback to further refine partnering implementation and are related to procedural performance aspects. The final performance dimension, being organizational performance, offers partnering organizations additional paybacks.

Intraorganizational performance is related to outcomes beneficial to long-term organizational success identified during *partnering* and analyzed after project completion. Some of these reported paybacks or outcomes are increased profit, closer relationships with client and other *partnering* parties, improved organizational competencies and corporate cultures, and the ability to seize new market opportunities (Cheng et al., 2000; Lazar et al., 1997). Again, many of these attributes are positioned to provide feedback during the *partnering* initiation and implementation stages.

4.4. Summary

This Chapter presented the findings as a result of the analysis undertaken to explore AEC *partnering* literature. More importantly, a sound taxonomy on this literature is asserted to guide industry practitioners and researchers as to the current state of AEC *partnering*. One of the most prominent deliverables was covered through a qualitative synthesis on *partnering* study characteristics, and then a preliminary quantitative analysis was used to explore relationships among substantive study features. The next chapter summarizes the results, presents limitations, and conclusions.

CHAPTER 5 SUMMARY AND CONCLUSIONS

The final chapter provides a summary of the results. In addition, it also offers theoretical and practical implications, limitations, recommendations for future research, and final conclusions, respectively.

5.1. Summary of the Results

This study attempted to understand vast body of AEC partnering literature that has been developed over the past 25 years. To do so, a meta-analytic approach was followed aiming to provide a sound taxonomy on *partnering* attributes found in the literature. Based on this, the study offers a useful framework of *partnering* and its associated variables which are critical to successful project partnering. Results from this study provide both researchers and practitioners with information to understand the depth and breadth of AEC *partnering* literature. For example, it is clearly evident from the qualitative results that a new research direction on *partnering* is needed to propel this concept forward in its understanding and implementation. With all of the research that has been conducted, it still lacks decisive evidence on its impact on performance outcomes. In fact, the decline in research may suggest that this concept, which is deeply rooted in organizational theory, is more difficult to understand than original expectations.

Initial findings from this research synthesis shows that *partnering* research in AEC literature has predominately received the most attention in the US and UK. In addition, the number of studies appears to be on a downward trend, especially in these two regions. Although other smaller countries seem to be growing in their *partnering* research investigations.

Other findings related to study characteristics, clearly point out that many researchers are taking advantage of quantitative methods to understand *partnering*; however, anecdotal studies accounted almost half (40%) of *partnering* research. As such, a potential gap is presented for additional empirically derived studies focused on deeply rooted sociological constructs developed during *partnering* via case studies. In part, because *partnering* is a dynamic process that continues to evolve as do projects which should be studied longitudinally. Sociological constructs such as knowledge exchanges and its implication on team integration are best understood through critical investigation of individuals and their associated behaviors. As such, the future of *partnering* research may best fit organizational theory investigated at the project team level. This is often alluded to by other researchers and is more conducive to qualitative or mixed method approaches (Bresnen, 2009; Bresnen, 2007; Bresnen, Goussevskaia, & Swan, 2005). Perhaps this type of research can help with concerns about the temporary impacts of *partnering* that does not appear to translate across multiple projects.

Results of this study and the *partnering* taxonomy show the following constructs are critical to success project partnering: 1) *planning and procurement oriented* items such as providing the appropriate contracting language and contractual forms identifying the *partnering* arrangement; 2) *relationship oriented* items such as ensuing that the interorganizational project teams are able to develop mutual trust, along with, communicating mutually beneficial goals and objectives for all *partnering* participants; and, 3) *process oriented* items which are those action items occurring during *partnering* such as keeping the support from top management from the respective home organizations and maintaining effective lines of communication

between interorganizational team members. The following Table 12 and Table 13 both display the top ranked *KPDs* and *performance outcomes* found in AEC *partnering* literature with a minimum reporting of 10 or more times identified in the literature.

Table 12: Ranking of Top Key Partnering Drivers in AEC Literature.

Constructs	Key Attributes	# of Times Identified	Ranking
Relationship Oriented	Mutual trust is established for interorganizational project team.	21	1
Process Oriented	Top management commitment and support.	20	2
Process Oriented	Effective and open communication or dialogue within the interorganizational project team.	16	3
Process Oriented	Continuous improvement workshops are used.	14	4
Relationship Oriented	Mutual goals and objectives are communicated to partnering participants.	14	4
Process Oriented	Early involvement of designer / contractor / subcontractors.	13	5
Planning / Procurement Oriented	*Clear contracting language and form of contract used; Incentives, feeds, risk-reward, or gainshare-painshare arrangements used.	12	6
Process Oriented	Regular monitoring of partnering process (Benchmarking)	12	6
Relationship Oriented	Strong team commitment.	12	6
Process Oriented	Team building sessions are used.	11	7
Process Oriented	Free flow of information among partnering participants.	10	8

***** Key attributes equally identified within AEC partnering studies.

Table 13: Top Performance Outcomes in AEC Partnering Literature.

Constructs	Key Attributes	# of Times Identified	Ranking
Process Performance	Improved relationship for partnering participants.	16	1
Quality / Safety Performance	Improve the quality of the project.	14	2
Schedule Performance	Meeting schedule targets.	12	3
Cost Performance	Meeting budgeted costs targets.	10	4
Dispute / Litigation Performance	Reduces disputes for the project.	10	4
Process Performance	Long-term trust established for project participants.	10	4

Other findings from this research show that *performance outcomes* are related to *partnering* and *key partnering drivers.* This is suggested from the *partnering* framework put forward in this research. The aim was to show links via AEC *partnering* literature which identifies the key performance variables attributed to *partnering.* As such, the variables are aggregated into the taxonomy of *partnering*.

5.2. Partnering Framework

A partnering framework is given in Figure 9 based on the evidence from AEC partnering literature. The framework displays a link between *key partnering drivers* and *successful partnering projects* (1-2), meaning when variables included within each construct category are appropriately attuned positive outcomes are anticipated for the project. Similarly, links (1-3) and (2-3) both maintain a positive association exists between both *key partnering drivers* and

project partnering with the *performance outcomes.* A moderated relationship (1-2(4)) is also identified in this *partnering* framework which includes variables that may attenuate the effects of *key partnering drivers* and the overall success of the partnered project. The moderated variables are categorized as public sector constraints (e.g., stringent public rules, regulations, and laws that discourage partnering).

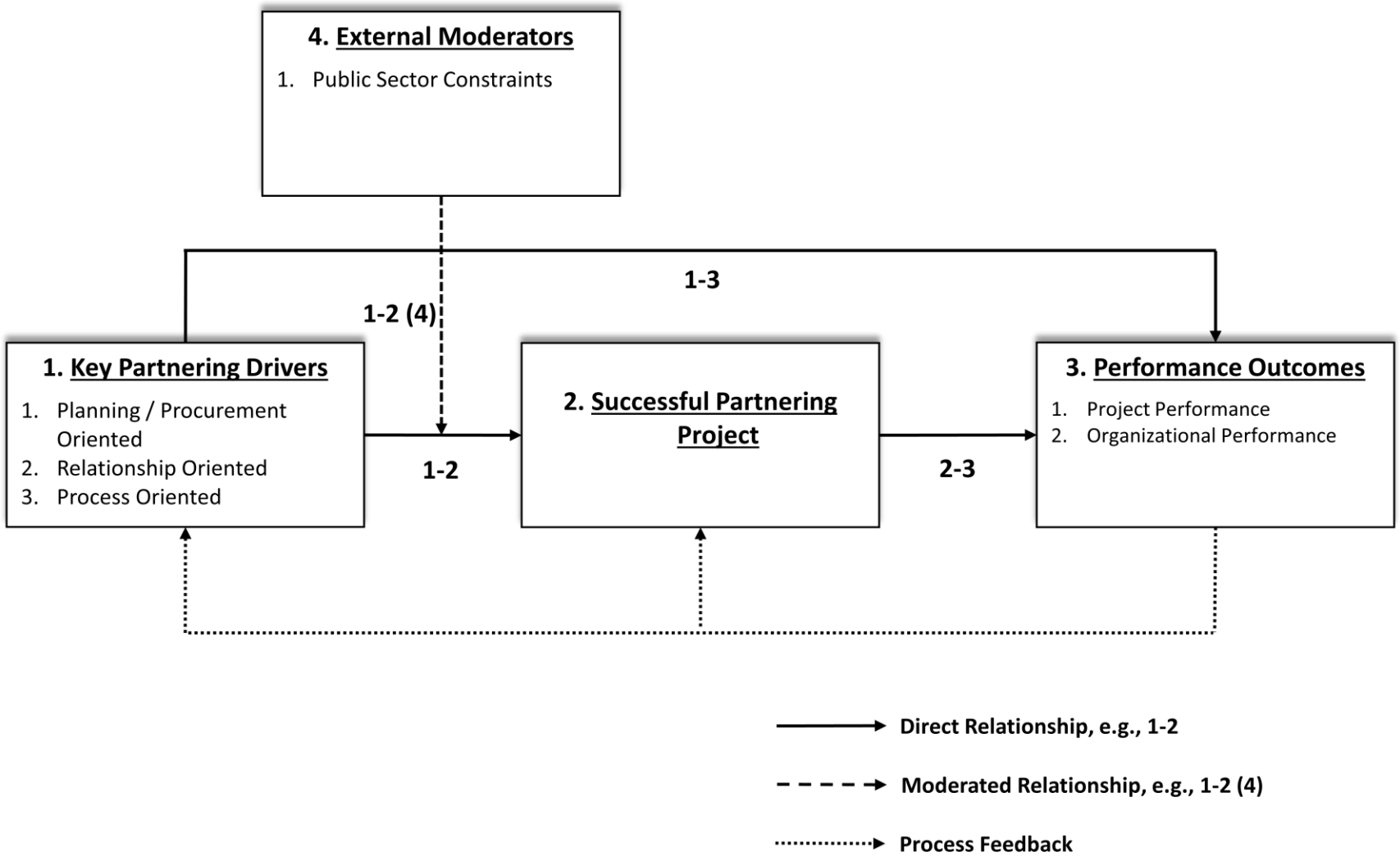


Figure 9: Framework Developed to Understand AEC Partnering Literature.

5.3. Theoretical Implication and Practical Application

This section will illuminate the findings from this study as they relate to previous partnering research in AEC literature. This research establishes guidance to the state of partnering research along with a valuable taxonomy available for further investigation. In addition, this study provided key drivers of partnering linking them to both project performance and overall partnering success.

Joining with prior research, this study shows that keys to *partnering* reside within the process of *partnering* implementation. Many studies point to variables such as gaining the support and commitment of top management, along with effective and open communications as prerequisites to maintain a successful *partnering* arrangement. For example, Black et al. (2000) ranks process oriented factors such as these among the highest to mitigate conflicts during the project and to ensure senior management is committed to the *partnering* approach.

Continuing with this notion, this research directs attention to the process oriented attributes providing the bulk of the variables identified in the AEC *partnering* literature. As such, industry practitioners involved in *partnering* would be wise to keep clear and open dialogues among interorganizational project teams. This collaborative environment, among project teams, allows for enhanced knowledge sharing and trusting relationships to develop which are proven beneficial to performance outcomes (Zhang & Ng, 2013; Solis et al., 2013; Chinowsky et al., 2011; Chinowsky et al., 2008). A similar sentiment is shared by Bemelmans, Voordijk, and Vos (2012) in their investigation specific to supplier-contractor collaborations in AEC industry. Based on their findings these two factors are most influential to successful *partnering*.

Over the decades clear project specific performance implications remains elusive, yet studies as this continue to report cost improvements are available through *partnering*. Early studies investigating *partnering performance outcomes* provide quantitative evidence alluding to (Anderson & Polkinghorn, 2012; Gransberg et al., 1999). This study aggregated over 23 performance related variables associated with cost. In particular, variables such as achieving budgeted costs and schedule goals are purported in AEC literature as key benefits of *partnering.* The problem with these measured *performance outcomes* stems from lack of longitudinal data and the singular nature of construction projects. Meaning it is difficult to draw conclusions based purely on the implementation of *partnering* especially with the uniqueness of construction projects.

5.4. Limitations and Recommendations for Future Research

In an effort to synthesize the literature on AEC *partnering* key limitations and areas for future research are identified. The following sections expound on these giving direction and guidance for other researchers.

5.4.1. Limitations

The main objective of this study was to synthesize the AEC literature on *partnering* using a meta-analytic approach. The goals and objectives for this study are achieved, despite several limitations. One such limitation is a direct result of this literature stream which does not provide statistical results reporting clear effect sizes on variables under consideration in *partnering.* Given this, a meta-analytic approach was followed in lieu of a traditional meta-analysis to provide guidance on AEC *partnering* literature. Despite this limitation, the results

from this study allows for a clear interpretation of *key partnering drivers* and *performance outcomes* attributable to *partnering*.

Based on the results and limitations the meta-analytic approach used in this study is suggested as a sound methodology in the AEC literature to aggregate findings from multiple studies. Although this study was not able fully deploy the meta-analysis techniques, others may find this approach beneficial to understand links between variables found in AEC research. More importantly, a meta-analytic approach gives great insight as to the dearth of literature available on topics under investigation and can help identify gaps in the knowledge for future research.

Based on the taxonomy of *partnering*, future researchers can begin to focus on key areas integral to successful *partnering*. Key findings from this research synthesis are available for testing and validation via case studies. Also, the synthesis sheds light on the need to collect additional data as it relates to measured performance outcomes. With this type of data, practitioners would gain greater confidence and insights to true *partnering* implications at both the project and organizational performance levels. For example, only a limited number of studies offer project level data although possibly stemming from the confidentiality associated with this information (Grajek et al., 2000; Gransberg et al., 1999). Despite this, a concerted effort is needed to gain access to project data to report tangible benefits all *partnering* practitioners can fully interpret.

5.4.2. Recommendations for Future Research

Two key areas are illuminated from this research synthesis which are available for other to explore. First, much research on AEC *partnering* stems from quantitative exploration of interorganizational project teams. For example, studies illuminating key success factors are dominate in the literature, yet the findings show that more qualitative studies on these same project teams are ripe with additional information (Chen & Chen, 2007; Cheng & Li, 2002; Black et al., 2000). Hartman and Bresnen (2011), for instance, argue that collaborative arrangements (i.e., *partnering*) are more suited to a more participatory research approach. This means the dynamic nature of construction lends best to a qualitative case study approach investigating the changing and evolutionary interactions among project teams. Utilizing the taxonomy resulting from this research, others are able to hone in on critical variables and test these via case study approaches.

Following this case study approach, this research offers a framework on *partnering*. The framework, with further explorations, may identify genuine or eliminate spurious relationships when tested through qualitative case study experiments. This line of inquiry, furthers the assertion that construction teams' relationships are contextualized and every evolving warranting longitudinal investigation (Hartman and Bresnen, 2011). Given this, studies imploring socio-psychological theories are more beneficial to understand *partnering* contextually, while also filling the gap in qualitative research into interorganizational *partnering* literature.

The second future direction from this research is the need for more quantitative results which are more malleable. Meaning, presenting findings which are relaxed for extrapolation of project performance or statistical inference data to make comparisons across studies. Since the initiation of this research stream only a limited number of studies attempt to offer guidance as to the project level benefits of *partnering.* Although difficult, future researchers may ease this comparison by providing several additional markers. First, by clearly pointing out the construction sector under investigation other researchers would, then, be able to ascertain the types of projects from which similar attributes are available. This would help relax the concern on making comparisons across project performance outcomes that result from the uniqueness of construction. Second, stronger metrics are needed to gain access to project performance indicators. Perhaps, other researchers can follow original project performance metrics first attend to by Grajek et al., (2000) and Gransberg et al., (1999) clearly suggesting cost and schedule performance variables. Again, a qualitative or even a mixed methods approach might spawn life into this line of AEC *partnering* literature through case study.

5.5. Conclusion

Partnering in the AEC industry has existed since the early 1980s and remains an elusive concept in its true implications on project success and performance outcomes. Many studies examining successful *partnering* are completed, yet are dispersed on specific benefits that are expected from *partnering.* Therefore, this study aimed not only to identify the various attributes on *partnering,* but to develop a sound taxonomy aggregating key variables into groups. To achieve this, a meta-analytic approach was followed to synthesize 173 *partnering* studies published

over the last 25 years. From this data, the researcher was able to aggregate, analyze, and present findings pertaining to the AEC *partnering* literature. Although a statistical analysis was afforded for only a few variables, the qualitative evidence from this study is very detailed in its depiction on our current state of *partnering* research in AEC literature.

APPENDICES

APPENDIX A: PARTNERING STUDIES RESULTING FROM DATA COLLECTION AND SCREENING.

Table 14: Partnering Studies Resulting from Data Collection and Screening sorted by Source of Publication.

Author(s)	Title	Source of Publication	Year
Cheung, S., Suen, H., and Cheung, K.	An automated partnering monitoring system-Partnering Temperature Index	Automation in Construction	2003
Yeomans, S., Bouchlaghem, N., and El-Hamalawi, A.	An evaluation of current collaborative prototyping practices within the AEC industry	Automation in Construction	2006
Yeung, J., Chan, A., Chan, D., and Li, L.	Development of a partnering performance index (PPI) for construction projects in Hong Kong: a Delphi Study	Automation in Construction	2007
Yeung, J., Chan, A., and Chan, D.	A computerized model of measuring and benchmarking the partnering performance of construction projects	Automation in Construction	2009
Carr, F., Hurtado, K., Lancaster, C., Markert, C., and Tucker, P.	Partnering in Construction: A Practical Guide to Project Success	Book	1999
Bennett, J., and Peace, S.	Partnering in the Construction Industry - A Code of Practice for Strategic Collaborative Working	Book	2006
Mosey, D.	Early Contractor Involvement in Building Procurement	Book	2009
Cheng, E., Li, H., Love, P., and Irani, Z.	Strategic alliances: a model for establishing long-term commitment to inter-organizational relations in construction	Building and Environment	2004
Chan, A, Chan, D., Fan, L., Lam, P., and Yeung, J.	Partnering for construction excellence-A reality or myth?	Building and Environment	2006
Cheng, E., and Li, H.	Application of ANP in process models: An example of strategic partnering	Building and Environment	2007
Wood, G., McDermott, P., and Swan, W.	The ethical benefits of trust-based partnering: the example of the construction industry	Business Ethics: A European Review	2002
Hughes, D., Williams, T., and Ren, Z.	Differing perspectives on collaboration in construction	Construction Innovation	2012
Bresnen, M., and Marshall, N.	Partnering in construction - a critical review of issues, problems and dilemmas	Construction Management and Economics	2000
Bresnen, M., and Marshall, N.	Building partnerships: case studies of client-contractor collaboration in the UK construction industry	Construction Management and Economics	2000
Bresnen, M., and Marshall, N.	Motivation, commitment and the use of incentives in partnerships and alliances	Construction Management and Economics	2000
Kwan, A., and Ofori, G.	Chinese culture and successful implementation of partnering in Singapore's construction industry	Construction Management and Economics	2001

Table 14 (Cont'd): Partnering Studies Resulting from Data Collection and Screening sorted by Source of Publication.

Author(s)	Title	Source of Publication	Year
Chan, A., Chan, D., and Ho, K.	An empirical study on the benefits of construction partnering in Hong Kong	Construction Management and Economics	2003
Wood, G., and Ellis, R.	Main contractor experiences of partnering relationships on UK construction projects	Construction Management and Economics	2005
Phua, F.	When is construction partnering likely to happen? An empirical examination of the role of institutional norms	Construction Management and Economics	2006
Eriksson, P.E., Pesamaa, O.	Modelling procurement effects on cooperation	Construction Management and Economics	2007
Mason, J.	The views and experiences of specialist contractors on partnering in the UK	Construction Management and Economics	2007
Kaluarachchi, Y., and Jones, K.	Monitoring of a strategic partnering process: the Amphion experience	Construction Management and Economics	2007
Yeung, J., Chan, A., and Chan, D.	Establishing quantitative indicators for measuring the partnering performance of construction projects in Hong Kong	Construction Management and Economics	2008
Doloi, H.	Relational partnerships: the importance of communication, trust and confidence and joint risk management in achieving project success	Construction Management and Economics	2009
Lau, E., and Rowlinson, S.	Interpersonal trust and inter-firm trust in construction projects	Construction Management and Economics	2009
Bresnen, M.	Living the dream? Understanding partnering as emergent practice	Construction Management and Economics	2009
Lai, I., and Lam, F.	Perceptions of various performance criteria by stakeholders in the construction sector in Hong Kong	Construction Management and Economics	2010
Bandefelt, U.	I trust you, I trust you not: a longitudinal study of control mechanisms in incentive contracts	Construction Management and Economics	2010
Eriksson, P.E.	Partnering: what it is, when should it be used, and how should it be implemented	Construction Management and Economics	2010
Bresnen, M.	Keeping it real? Constituting partnering through boundary objects	Construction Management and Economics	2010

Table 14 (Cont'd): Partnering Studies Resulting from Data Collection and Screening sorted by Source of Publication.

Author(s)	Title	Source of Publication	Year
Tabish, S., and Jha, K.	Identification and evaluation of success factors for public construction projects	Construction Management and Economics	2011
Lahdenpera, P.	Making sense of the multi-party contractual arrangements of project partnering, project alliancing and integrated project delivery	Construction Management and Economics	2012
Bubshait, A.	Partnering: An innovative and effective project organization concept	Cost Engineering	2001
Hartmann, A., and Bresnen, M.	The emergence of partnering in construction practice: an activity theory perspective	Engineering Project Organization Journal	2013
Loraine, R.	Project specific partnering	Engineering, Construction and Architectural Management	1993
Li, H., Cheng, E., and Love, P.	Partnering research in construction	Engineering, Construction and Architectural Management	2000
Fortune, C., and Setiawan, S.	Partnering practice and the delivery of construction projects for Housing Associations in the Uk	Engineering, Construction and Architectural Management	2006
Ingirige, B., and Sexton, M.	Alliances in construction: Investigating initiatives and barriers for long-term collaboration	Engineering, Construction and Architectural Management	2006
Eriksson, P.E., and Laan, A.	Procurement effects on trust and control in client-contractor relationships	Engineering, Construction and Architectural Management	2007
Jones, K., and Kaluarachchi, Y.	Operational factors affecting strategic partnering in UK social housing	Engineering, Construction and Architectural Management	2007
Swan, W., and Khalfan, M.	Mutual objective setting for partnering in the public sector	Engineering, Construction and Architectural Management	2007
Eriksson, P.E., Nilsson, T., and Atkin, B.	Client perceptions of barriers to partnering	Engineering, Construction and Architectural Management	2008

Table 14 (Cont'd): Partnering Studies Resulting from Data Collection and Screening sorted by Source of Publication.

Author(s)	Title	Source of Publication	Year
Phillips, S., Martin, J., Dainty, A., and Price, A.	Analysis of the quality attributes used in establishing best value tenders in the UK social housing sector	Engineering, Construction and Architectural Management	2008
Eriksson, P.E., Atkin, B., and Nilsson, T.	Overcoming barriers to partnering through cooperative procurement procedures	Engineering, Construction and Architectural Management	2009
Davis, P., and Love, P.	Alliance contracting: Added value through relationship development	Engineering, Construction and Architectural Management	2011
Hughes, D., Williams, T., and Ren, Z.	Is incentivisation significant in ensuring successful partnered projects?	Engineering, Construction and Architectural Management	2012
Akintoye, A., McIntosh, G., and Fitzgerald, E.	A survey of supply chain collaboration and management in the UK construction industry	European Journal of Purchasing & Supply Management	2000
Zuo, J., Chan, A., Zhao, Z., Zillante, G., and Xia, B.	Supporting and impeding factors for partnering in construction: a China study	Facilities	2013
Ning, Y., and Ling, Y.	Comparative study of drivers of and barriers to relational transactions faced by public clients, private contractors and consultants in public projects	Habitat International	2013
Larson, E.	Partnering on Construction Projects: A Study of the Relationship Between Partnering Activities and Project Success	IEEE Transactions on Engineering Management	1997
Construction Industry Institute (CII)	Meeting the Challenges of the Future	Industry Report	1989
Construction Industry Institute (CII)	In Search of Partnering Excellence	Industry Report	1991
Associated General Contractors (AGC)	Partnering - A Concept for Success	Industry Report	1991
Construction Industry Institute (CII)	Partnering II - A Model for Excellence	Industry Report	1996
Gransberg, D., Reynolds, H., Boyd, J., and Gokdogan, G.	Evaluation of TxDOT Partnering Plus Program	Industry Report	1998
Rogge, D., Griffith, P., and Hutchins, W.	Improving the Effectiveness of Partnering	Industry Report	2002

Table 14 (Cont'd): Partnering Studies Resulting from Data Collection and Screening sorted by Source of Publication.

Author(s)	Title	Source of Publication	Year
Polkinghorn, B., La Chance, R., and La Chance, H.	"An analysis of the Maryland Department of Transportation State Highway Administration's partnering program and process"	Industry Report	2006
U.S. Army Corps of Engineers	Partnering: A Tool for USACE, Engineering, Construction, and Operations	Industry Report	2010
Caltrans	Caltrans Subcommittee Meeting Report	Industry Report	2011
Wong, A.	Partnering in construction industry: Hong Kong context	International Journal of Project Management	1997
Bower, D, Crabtree, E., and Koegh, W.	Rhetorics and realities in new product development in the subsea oil industry	International Journal of Project Management	1997
Black, C., Akintoye, A., and Fitzgerald, E.	An analysis of success factors and benefits of partnering in construction	International Journal of Project Management	2000
Boddy, D., and MacBeth, D.	Prescriptions for managing change: A survey of their effects in projects to implement collaborative working between organisations	International Journal of Project Management	2000
Li, H., Cheng, E., Love, P., Irani, Z.	Co-operative benchmarking: a tool for partnering excellence in construction	International Journal of Project Management	2001
Ng, S., Rose, T., Mak, M., and Chen, S.	Problematic issues associated with project partnering - the contractor perspective	International Journal of Project Management	2002
Bresnen, M., and Marshall, N.	The engineering or evolution of co-operation? A tale of two partnering projects	International Journal of Project Management	2002
Naoum, S.	An overview into the concept of partnering	International Journal of Project Management	2003
Cheung, S., Ng, T., Wong, S., and Suen, H.	Behavioral aspects in construction partnering	International Journal of Project Management	2003
Packham, G., Thomas, B., and Miller, C.	Partnering in the house building sector: a subcontractor's view	International Journal of Project Management	2003
Kadefors, A.	Trust in project relationships—inside the black box	International Journal of Project Management	2004
Bayliss, R., Cheung, S., Suen, H., and Wong, S.	Effective partnering tools in construction: a case study on MTRC TKE contract 604 in Hong Kong	International Journal of Project Management	2004

Table 14 (Cont'd): Partnering Studies Resulting from Data Collection and Screening sorted by Source of Publication.

Author(s)	Title	Source of Publication	Year
Shek-Pui Wong, P., and Cheung, S.	Trust in construction partnering; views from parties of the partnering dance	International Journal of Project Management	2004
Beach, R., Webster, M., and Campbell, K.	An evaluation of partnership development in the construction industry	International Journal of Project Management	2005
Bresnen, M.	Deconstructing partnering in project-based organisation: Seven pillars, seven paradoxes and seven deadly sins	International Journal of Project Management	2007
Lu, S., and Yan, H.	A model for evaluating the applicability of partnering in construction	International Journal of Project Management	2007
Lu, S., and Yan, H.	An empirical study on incentives of strategic partnering in China: Views from construction companies	International Journal of Project Management	2007
Chen, W., and Chen, T.	Critical success factors for construction partnering in Taiwan	International Journal of Project Management	2007
Alderman, N. and Ivory, C.	Partnering in major contacts: Paradox and metaphor	International Journal of Project Management	2007
Kadefors, A., Bjorlingson, E., and Karlsson, A.	Procuring service innovations: Contractor selection for partnering projects	International Journal of Project Management	2007
Errasti, A., Beach, R., Oyarbide, A., and Santos, J.	A process for developing partnerships with subcontractors in the construction industry: An empirical study	International Journal of Project Management	2007
Pesamaa, O, Eriksson, P.E., and Hair, J.	Validating a model of cooperative procurement in the construction industry	International Journal of Project Management	2009
Tang, L., Shen, Q., and Cheng, E.	A review of studies on Public-Private Partnership projects in the construction industry	International Journal of Project Management	2010
Yeung, J., Chan, A., and Chan, D.	Defining relational contracting from the Wittgensteing family-resemblance philosophy	International Journal of Project Management	2012
Meng, X.	The effect of relationship management on project performance in construction	International Journal of Project Management	2012
Ling, F., Ong, S., Ke, Y., Wang, S., and Zou, P.	Drivers and barrier to adopting relational contracting practices in public projects: Comparative study of Beijing and Sydney	International Journal of Project Management	2014

Table 14 (Cont'd): Partnering Studies Resulting from Data Collection and Screening sorted by Source of Publication.

Author(s)	Title	Source of Publication	Year
Smith, A., and Culp, G.	Continuous Partnering Helps Ensure Project Success	Journal of American Water Works Association	2000
Voyton, V., and Siddiqi, K.	Partnering: Tool for Construction Claims Reduction	Journal of Architectural Engineering	2004
Raziszewska-Zielina, E.	Fuzzy Control of Partnering Relations of a Construction Enterprise	Journal of Civil Engineering and Management	2011
Pocock, J., Hyun, C., Liu, L., and Kim, M.	Relationship between project interaction and performance indicators	Journal of Construction Engineering and Management	1996
Puddicombe, M.	Designers and contractors: Impediments to integration	Journal of Construction Engineering and Management	1997
Conley, M., and Gregory, R.	Partnering on Small Construction Projects	Journal of Construction Engineering and Management	1999
Gransberg, D., Dillon, W., Reynolds, H., and Boyd, J.	Quantitative Analysis of Partnered Project Performance	Journal of Construction Engineering and Management	1999
Drexler, J., and Larson, E.	Partnering: Why Project Owner- Contractor Relationships Change	Journal of Construction Engineering and Management	2000
Gladola, C. and Sheedy, W.	Partnering on Defense Contracts	Journal of Construction Engineering and Management	2002
Cheng, E., and Li, H.	Development of a Practical Model of Partnering for Construction Projects	Journal of Construction Engineering and Management	2004
Chan, A., Chan, D., Chiang, Y., Tang, B., Chan, E., and Ho, K.	Exploring Critical Success Factors for Partnering in Construction Projects	Journal of Construction Engineering and Management	2004

Table 14 (Cont'd): Partnering Studies Resulting from Data Collection and Screening sorted by Source of Publication.

Author(s)	Title	Source of Publication	Year
Wong, P., Cheung, S., and Ho, P.	Contractor as Trust Initiator in Construction Partnering-Prisoner's Dilemma Perspective	Journal of Construction Engineering and Management	2005
Tang, W., Duffield, C., and Young, D.	Partnering Mechanisms in Construction: An Empirical Study on the Chinese Construction Industry	Journal of Construction Engineering and Management	2006
Anvuur, A., and Kumaraswamy, M.	Conceptual model of partnering and alliancing	Journal of Construction Engineering and Management	2007
Eriksson, P.E.	Procurement Effects on Coopetition in Client-Contractor Relationships	Journal of Construction Engineering and Management	2008
Eom, C., Yun, S., and Paek, J.	Subcontractor evaluation and management framework for strategic partnering	Journal of Construction Engineering and Management	2008
Johnson, T., Feng, P., Sitzabee, W., and Jernigan, M.	Federal Acquisition Regulation Applied to Alliancing Contract Practices	Journal of Construction Engineering and Management	2013
Grajek, K, Gibson, G, Tucker, R.,	Partnered Project Performance in Texas Department of Transportation	Journal of Infrastructure Systems	2000
Anderson, L. and Polkinghorn, B.	Efficacy of Partnering on the Woodrow Wilson Bridge Project: Empirical Evidence of Collaborative Problem-Solving Benefits	Journal of Legal Affairs and Dispute Resolution in Engineering and Construction	2011
Cook, E. and Hancher, D.	Partnering: Contracting for the Future	Journal of Management in Engineering	1990
Weston, D. and Gibson Jr., E.	Partnering-Project Performance in US Army Corps of Engineers	Journal of Management in Engineering	1993
Harback, H., Basham, D., and Buhts, R.	Partnering paradigm	Journal of Management in Engineering	1994
Abudayyeh, O.	Partnering: a team building approach to quality construction management	Journal of Management in Engineering	1994

Table 14 (Cont'd): Partnering Studies Resulting from Data Collection and Screening sorted by Source of Publication.

Author(s)	Title	Source of Publication	Year
Crowley, L., and Karim, A.	Conceptual Model of Partnering	Journal of Management in Engineering	1995
Ellison, S., and Miller, D.	Beyond ADR: working toward synergistic strategic partnership	Journal of Management in Engineering	1995
Larson, E.	Project Partnering: Results of Study of 280 Construction Projects	Journal of Management in Engineering	1995
Bates, G.	I don't believe in change just for the sake of change	Journal of Management in Engineering	1996
Miles, R.	Twenty-first century partnering and the role of ADR	Journal of Management in Engineering	1996
Nielsen, D.	Partnering for performance	Journal of Management in Engineering	1996
Bates, G.	Garden of Managerial Delights	Journal of Management in Engineering	1996
Crane, T., Felder, J., Thompson, P., Thompson, M., and Sanders, S.	Partnering Process Model	Journal of Management in Engineering	1997
Love, S.	Subcontractor partnering: I'll believe it when I see it	Journal of Management in Engineering	1997
Lazar, F.	Partnering-New benefits from peering inside the black box	Journal of Management in Engineering	1997
Brooke, K., and Litwin, G.	Mobilizing the partnering process	Journal of Management in Engineering	1997
Gardiner, P., and Simmons, E.	Conflict in Small-and Medium-Sized Projects: Case of Partnering To The Rescue	Journal of Management in Engineering	1998
Crane, T., Felder, J., Thompson, P., Thompson, M., and Sanders, S.	Partnering Measures	Journal of Management in Engineering	1999
Thompson, P., and Sanders, S.	Partnering Continuum	Journal of Management in Engineering	1999

Table 14 (Cont'd): Partnering Studies Resulting from Data Collection and Screening sorted by Source of Publication.

Author(s)	Title	Source of Publication	Year
Cheng, E., Li, H., and Love, P.E.D.	Establishment of critical success factors for construction partnering	Journal of Management in Engineering	2000
DeVilbiss, C., and Leonard, P.	Partnering is the foundation of a Learning Organization	Journal of Management in Engineering	2000
Lazar, F.	Project Partnering: Improving the Likelihood of Win/Win Outcomes	Journal of Management in Engineering	2000
Kumaraswamy, M., and Matthews, J.	Improved subcontractor selection employing partnering principles	Journal of Management in Engineering	2000
Cheng, E., Li, H., Drew, D., and Yeung, N.	Infrastructure of partnering for construction projects	Journal of Management in Engineering	2001
Pena-Mora, F., and Harpoth, N.	Effective partnering in innovative procured multicultural project	Journal of Management in Engineering	2001
Cheng, E., and Li, H.	Construction Partnering Process and Associated Critical Success Factors: Quantitative Investigation	Journal of Management in Engineering	2002
Chan, A., Chan, D., and Ho, K.	Partnering in Construction: Critical Study of Problems for Implementation	Journal of Management in Engineering	2003
Wong, P., and Cheung, S.	Structural Equation Model of Trust and Partnering Success	Journal of Management in Engineering	2005
Maturana, S., Alarcon, L., Gazmuri, P., and Vrsalovic, M.	On-site subcontractor evaluation method based on lean principles and partnering practices	Journal of Management in Engineering	2007
Chan, A, Chan, D., Fan, L., Lam, P., and Yeung, J.	Achieving Partnering Success through an Incentive Agreement: Lessons Learned from an Underground Railway Extension Project in Hong Kong	Journal of Management in Engineering	2008
Eriksson, P.E., and Nilsson, T.	Partnering the Construction of a Swedish Pharmaceutical Plant: Case Study	Journal of Management in Engineering	2008
Cho, K., Hyun, C., Koo, K., and Hong, T.	Partnering process model for public-sector fast-track design-build projects in Korea	Journal of Management in Engineering	2010
Hong, Y., Chan, D., Chan, A., and Yeung, J.	Critical Analysis of Partnering Research Trend in Construction Journals	Journal of Management in Engineering	2012

Table 14 (Cont'd): Partnering Studies Resulting from Data Collection and Screening sorted by Source of Publication.

Author(s)	Title	Source of Publication	Year
Doloi, H.	Empirical Analysis of Traditional Contracting and Relationships Agreements for Procuring Partners in Construction Projects	Journal of Management in Engineering	2013
Chen, T., and Kao, C.	A Study of Identifying Success Variables for Construction Partnering via SEM Framework	Journal of Marine Science and Technology	2010
Tang, W., Qiang, M., Duffield, C., Young, D., and Lu, Y.	Enhancing Total Quality Management by Partnering in Construction	Journal of Professional Issues in Engineering Education and Practice	2009
Bygballe, L., Jahre, M., and Sward, A.	Partnering relationships in construction: A literature review	Journal of Purchasing & Supply Management	2010
Gadde, L., and Dubois, A.	Partnering in the construction industry-Problems and opportunities	Journal of Purchasing & Supply Management	2010
Laan, A., Noorderhaven, N., Voordijk, H., and Dewulf, G.	Building trust in construction partnering projects: An exploratory case-study	Journal of Purchasing & Supply Management	2011
Le-Hoai, L., Lee, Y., and Son, J.	Partnering in Construction: Investigation of Problematic Issues for Implementation in Vietnam	Korean Society of Civil Engineering Journal of Civil Engineering	2010
Saunders, K., and Mosey, D.	PPC 2000: Association of consultant architects standard form of project partnering contract	Lean Construction Journal	2005
Keil, J.	How Partnering Benefits the Construction Process	Pipeline & Gas Journal	2007
Adnan, H., Shamsuddin, S., Supardi, A., and Ahmad, N.	Conflict Prevention in Partnering Projects	Procedia - Social and Behavioral Sciences	2012
Barnes, M.	Civil engineering management in the Industrial Revolution	Proceedings of the Institute of Civil Engineers: Civil Engineer	2000
Gellatly, G., Burtwistle, P., and Baldwin, A.	Groupware—the key to successful partnering: a case study	Proceedings of the Institute of Civil Engineers: Civil Engineer	2000
Cathcart, A.	Channel Tunnel Rail Link: a contract partnership	Proceedings of the Institute of Civil Engineers: Civil Engineer	2003

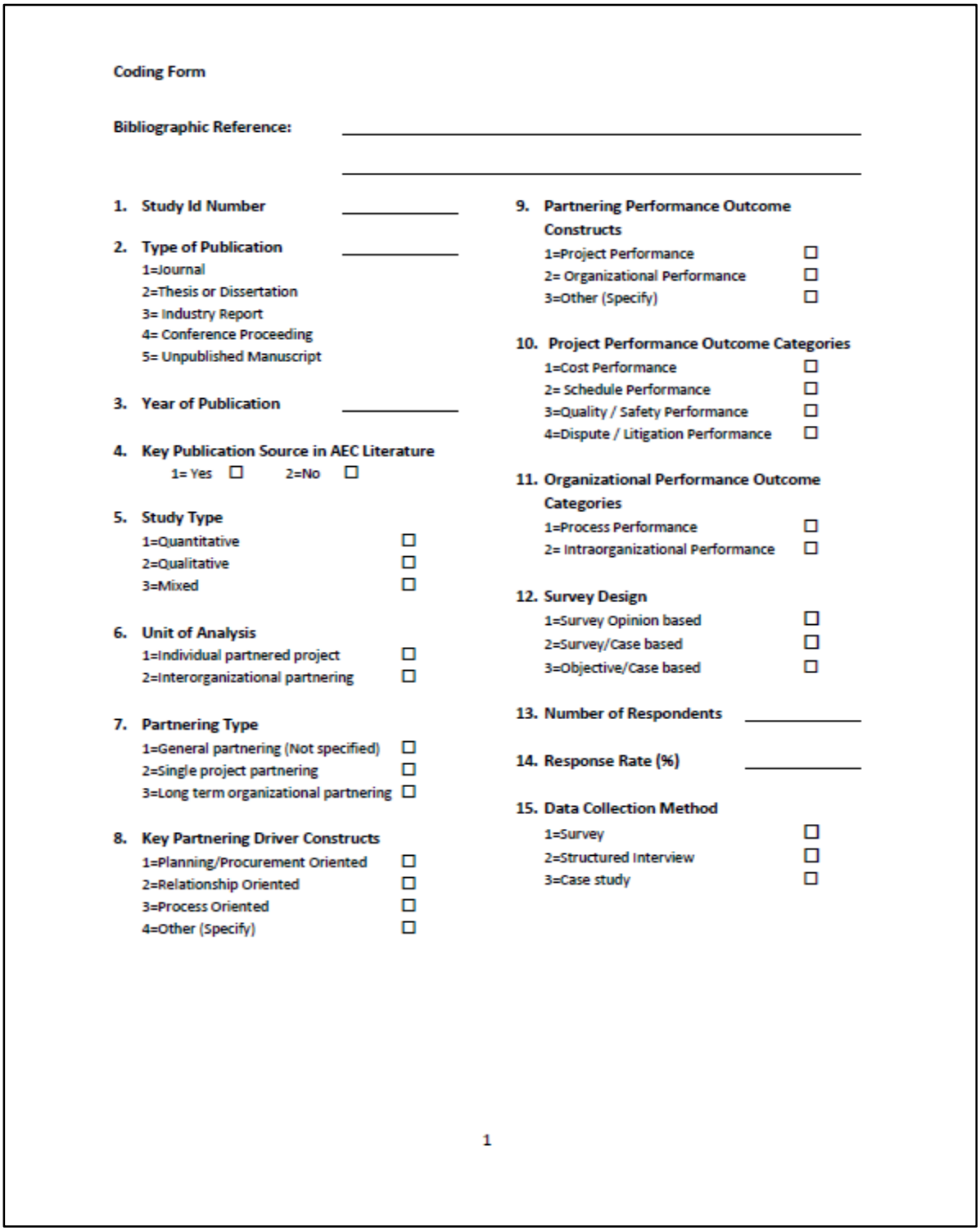
Table 14 (Cont'd): Partnering Studies Resulting from Data Collection and Screening sorted by Source of Publication.

Author(s)	Title	Source of Publication	Year
Hartshorne, D., and Cadman, P.	Storm Flood Relief Tank - Westbourne Avenue, Rhyl.	Proceedings of the Institute of Civil Engineers: Municipal Engineer	1999
Edmonds, M., and Hogan, M.	Millennium coastal park: Llanelli land bridges	Proceedings of the Institute of Civil Engineers: Municipal Engineer	2000
Crane, A.	Local authorities achieve best value through partnering and demonstration	Proceedings of the Institute of Civil Engineers: Municipal Engineer	2001
Stephens, M., and Thomas, D.	Partnership: a marriage made in Kent	Proceedings of the Institute of Civil Engineers: Municipal Engineer	2001
Cunningham, L., and Pomfret, M.	Partnering contracts in practice at Blackpool, UK	Proceedings of the Institute of Civil Engineers: Municipal Engineer	2007
Gullick, D., Cairns, R., and Pearson-Kirk, D.	Application of partnering principles to a framework contract	Proceedings of the Institute of Civil Engineers: Municipal Engineer	2007
Harwood, K., and Follett, B.	Warwickshire-Arup partnership: The first five years	Proceedings of the Institute of Civil Engineers: Municipal Engineer	2007
Rankin, J., Jameson, P., Yarwood, N.	NEC X12 at the heart of Worcestershire Highways	Proceedings of the Institute of Civil Engineers: Municipal Engineer	2007
Turner, J. Pearce, S., Fenton, M., and Sims, B.	Effective partnering—remediating the former Avenue coking works	Proceedings of the Institute of Civil Engineers: Municipal Engineer	2007
Aggus, S. and Hiscocks, E.	Coventry framework partnership	Proceedings of the Institute of Civil Engineers: Municipal Engineer	2007
Orr, J.	The ruby bay bypass-the project that pushed the boundaries	Proceedings of the Institute of Civil Engineers: Municipal Engineer	2012

Table 14 (Cont'd): Partnering Studies Resulting from Data Collection and Screening sorted by Source of Publication.

Author(s)	Title	Source of Publication	Year
Cowan, Charles, Clifford Gray, and Erik Larson.	Project partnering	Project Management Institute	1992
Moore, Carl, Donald Mosley, and Michelle Slagle.	Partnering guidelines for win-win project management	Project Management Institute	1992
Romancik, D.	Partnership toward improvement	Project Management Institute	1995
Schmader, K. and Gibson, G.	Partnered project performance in US naval facilities engineering command	Project Management Institute	1995
Back, W. and Sanders, S.	Partnering in a unit price environment	Project Management Institute	1996
Larson, E., and Drexler, J.	Barriers to project partnering: report for the firing line	Project Management Institute	1997
Thomas, S., Tucker, R., and Kelly, W.	Compass: An Assessment Tool for Improving Project Team Communications	Project Management Institute	1999
Jiang, J., Klein, G., and Chen, H.	The Relative Influence of IS Project Implementation Policies and Project Leadership on Eventual Outcomes	Project Management Institute	2001
Jiang, J., Klein, G., and Discenza, R.	Pre-project partnering impact on an information system project, project team and project management	Project Management Institute	2002
Barlow, J.	Innovation and learning in complex offshore construction projects	Research Policy	2000
Manley, K.	Partnering and Alliancing on Road Projects in Australia and Internationally	Road and Transport Research	2002
Humphreys, P., Matthews, J., and Kumaraswamy, M.	Pre-construction project partnering: from adversarial to collaborative relationships	Supply Chain Management: An International Journal	2003
Weston, D.	An Analysis of Project Performance for Partnering Projects in the U.S. Army Corps of Engineers	Thesis	1992

APPENDIX B: PARTNERING RESEARCH CODING FORM.



Coding Form

Bibliographic Reference: _____

_____

1. Study Id Number _____

2. Type of Publication _____
   1=Journal
   2=Thesis or Dissertation
   3= Industry Report
   4= Conference Proceeding
   5= Unpublished Manuscript

3. Year of Publication _____

4. Key Publication Source in AEC Literature
   1= Yes ☐ 2=No ☐

5. Study Type
   1=Quantitative ☐
   2=Qualitative ☐
   3=Mixed ☐

6. Unit of Analysis
   1=Individual partnered project ☐
   2=Interorganizational partnering ☐

7. Partnering Type
   1=General partnering (Not specified) ☐
   2=Single project partnering ☐
   3=Long term organizational partnering ☐

8. Key Partnering Driver Constructs
   1=Planning/Procurement Oriented ☐
   2=Relationship Oriented ☐
   3=Process Oriented ☐
   4=Other (Specify) ☐

9. Partnering Performance Outcome Constructs
   1=Project Performance ☐
   2= Organizational Performance ☐
   3=Other (Specify) ☐

10. Project Performance Outcome Categories
    1=Cost Performance ☐
    2= Schedule Performance ☐
    3=Quality / Safety Performance ☐
    4=Dispute / Litigation Performance ☐

11. Organizational Performance Outcome Categories
    1=Process Performance ☐
    2= Intraorganizational Performance ☐

12. Survey Design
    1=Survey Opinion based ☐
    2=Survey/Case based ☐
    3=Objective/Case based ☐

13. Number of Respondents _____

14. Response Rate (%) _____

15. Data Collection Method
    1=Survey ☐
    2=Structured Interview ☐
    3=Case study ☐

1

Figure 10: Partnering Research Coding Form.

Figure 10 (Cont'd): Partnering Research Coding Form.

Coding Form

16. Construction Industry Sector

1=Public/Vertical ☐
2=Private/Vertical ☐
3=Public/Horizontal ☐
4=Private/Horizontal ☐
5=Not specified ☐

(i.e., vertical means office buildings, schools, mixed use projects; horizontal means major infrastructure such as bridges, roadway or transportation projects).

17. Country of Sample

1=United States ☐
2=United Kingdom ☐
3=China ☐
4=Australia ☐
5=Other (Specify) ☐

18. Other Information and Notes

_____
_____
_____
_____
_____

2

APPENDIX C: PARTNERING CODING MANUAL

CODING MANUAL

I. CHARACTERISTICS OF PUBLICATION OR SOURCE

***Bibliographic Reference*:** This refers to the citation information to easily match the original study to coding forms and includes author(s), publication title, and publication.

1. ***Study ID Number*** (ID=three digits): This refers to the unique identifier assigned to the original study used to match the data in the meta-analysis with the study.

2. ***Type of Publication*** **(**TYPPUB=one digit): This indicates the source of the study and is used to determine magnitude in results across publications and external validity testing such as publication bias.

1=Journal
2=Thesis or Dissertation
3=Industry Report
4=Conference Proceeding
5=Unpublished Manuscript

3. ***Year of Publication*** (PUBYR=four digits): This indicates the year of publication.

4. ***Key Publication Source in AEC Literature*** (KEYPUB=one digit): This refers to the quality of publication in AEC literature according to Hong et al. (2012) and Chou Kwong (1997) also used to learn publication bias. Additionally, this information is used to understand implications between highly cited publications entailing greater rigor in conceptualization and methodology from those publication sources receiving fewer citations.

1

Figure 11: Partnering Coding Manual.

Figure 11 (Cont'd): Partnering Coding Manual.

1=Yes	2=No

II. STUDY CHARACTERISTICS

5. *Study Type* (STUTYP=one digit): This indicates the research design strategy employed within each study and is used in meta-analysis data evaluation and analysis.

1=Quantitative
2=Qualitative
3=Mixed Methods

6. *Unit of Analysis* (UNITA-one digit): This refers to the type of partnering investigated within each study (i.e., data resulting from partnered projects, data resulting from interorganizational partnering participants).

1=Individual Partnered Project
2=Interorganizational Partnering

7. *Partnering Type* (PARTYP-one digit): This refers to partnering characteristics identified in AEC *partnering* literature investigated within each study.

1=General Partnering (Not specified)
2=Single Project Partnering
3=Long-term Organizational Partnering

8. *Key Partnering Driver Constructs* (KPDC-one digit): This refers to the *partnering* antecedent construct categorizations in which each study variables are assigned based on AEC *partnering* literature.

1=Planning/Procurement Oriented
2=Relationship Oriented
3=Process Oriented
4=Other (Specify)

2

Figure 11: (Cont'd): Partnering Coding Manual.

9. *Performance Outcome Constructs* (PEROUTC-one digit): This refers to the construct categorizations for outcomes attributed to *partnering* in which each study variables are assigned based on AEC *partnering* literature.

1=Project Performance
2=Organizational Performance
3=Other (Specify

10. *Project Performance Outcomes* (PPERFOUT-one digit): This refers to the construct categories for project performance outcomes attributed to *partnering* in which each study variables are assigned based on AEC *partnering* literature.

1=Cost Performance
2=Schedule Performance
3=Quality / Safety Performance
4=Dispute / Litigation Performance

11. *Organizational Performance Outcomes* (OPERFOUT-one digit): This refers to the construct categories for organizational performance outcomes attributed to *partnering* in which each study variables are assigned based on AEC *partnering* literature.

1=Process Performance
2=Intraorganizational Performance

12. *Survey Design* (SURVD-one digit): The survey design refers to research methodology used in each study i.e., opinion based survey instrument used to collect subjective data from those with partnering experience, case study project(s) used to collect subjective data through participant survey instrument, or case study project(s) used for objective data collection from the project.

3

Figure 11 (Cont'd): Partnering Coding Manual.

1=Survey/Opinion Based
2=Survey/Case Based
3=Objective/Case Based

13. ***Number of Respondents*** (NRESP-appropriate number of digits): This refers to the number of respondents to the survey in each study.

14. ***Response Rate*** (RESPR-two digit): This refers to the percentage of respondents as compared to the initial study request within in each study.

15. ***Data Collection Method*** (DATACM-one digit): This indicates which type of data collection method is used in each study.

1=Survey
2=Structured Interview
3=Case Study

16. ***Construction Industry Sector*** (CONSEC-one digit): This indicated what construction sector each study examines i.e., public refers to projects funded through government entities for public or government use, private refers to projects for private used and funded as such, vertical means office buildings, schools, mixed-use projects, and horizontal means major infrastructure such as bridges, roadways, or transportation projects.

1=Public/Vertical
2=Private/Vertical
3=Public/Horizontal
4=Private/Horizontal
5=Not Specified

4

Figure 11 (Cont'd): Partnering Coding Manual.

17. ***Country of Study*** (COUN-one digit): This refers to the country from which each study is conducted or country of the first author when information is not clearly elicited from the study.

1=United States
2=United Kingdom
3=China
4=Australia
5=Other (Specify)

5

APPENDIX D: KEY PARTNERING DRIVER CONSTRUCTS AND VARIABLES

Table 15: Key Partnering Driver Constructs and Variables.

PLANNING / PROCUREMENT	VARIABLE	RELATIONSHIP	# OF TIMES IDENTIFIED
Contract language and form of contract	PLAN06	+	12
Incentives / Fees / risk-reward/ gainshare-painshare	PLAN14	+	12
Financial security/stability	PLAN10	+	9
Poor understanding of the concept	PLAN29	-	9
Availability of resources	PLAN01	+	8
Partnering experience	PLAN27	+	8
Shared Equity	PLAN34	+	7
Contract size or appropriate project size	PLAN07	+	6
Good cultural fit	PLAN11	+	6
High cost to adopt partnering	PLAN12	-	6
Partnering agreement	PLAN26	+	6
Previous work experience with other members	PLAN30	+	6
Technical expertise	PLAN37	+	6
Clear and Compatible goals	PLAN03	+	4
Time required to develop	PLAN38	+	4
Competent	PLAN04	+	3
Incompatible organizational cultures	PLAN15	-	3
Incompatible project type	PLAN16	-	3
Joint contractor selection	PLAN17	+	3
Joint project charter	PLAN18	+	3
Owner capacity and organization	PLAN25	+	3
Past negative experience	PLAN28	-	3
Prequalification	PLAN31	+	3
Reputation	PLAN33	+	3
Broad partnering team	PLAN02	+	2
Equality among partnering participants	PLAN08	+	2
Fair profit assumptions	PLAN09	+	2
High ethical standards	PLAN13	+	2
Joint specifications	PLAN19	+	2
Lack of client initiatives in RC practice	PLAN20	-	2
Lack of knowledge of relational approach	PLAN22	-	2
Limited bid invitations	PLAN23	-	2
Project duration	PLAN32	+	2
Strategic benefits unclear	PLAN35	+	2
Cooperative skills	PLAN05	+	1
Lack of common goals	PLAN21	-	1
Low-bid mentality	PLAN24	-	1
Supervision and management characteristics	PLAN36	+	1
TOTAL			**160**

Table 15 (Cont'd): Key Partnering Driver Constructs and Variables.

RELATIONSHIP ORIENTED	VARIABLE	RELATIONSHIP	TOTAL
Mutual trust	REL24	+	21
Mutual goals and objectives communicated	REL23	+	14
Team commitment	REL28	+	12
Commitment	REL03	+	7
Equal power/empowerment	REL11	+	6
Positive Attitude	REL25	+	6
Integrated team	REL14	+	5
Mutual interest	REL22	+	5
Acting consistent with objectives	REL01	+	4
Honesty	REL13	+	4
Lack of trust	REL20	-	4
Unity	REL32	+	4
Win / win motivation	REL33	+	4
Common vision	REL05	+	3
Company wide acceptance	REL06	+	3
Concerns about opportunistic behavior	REL07	-	3
Dedicated team	REL09	+	3
Lack of acceptance as long-term business strategy	REL18	-	3
Align relationships with objectives	REL02	+	2
Integrity	REL15	+	2
Inter-personal/cultural clash	REL16	-	2
Teamwork	REL29	+	2
Timely responsiveness	REL30	+	2
Unenthusiastic participation	REL31	-	2
Commitment to win/win attitude	REL04	+	1
Cooperation	REL08	+	1
Ego/personality indifference	REL10	-	1
Fear of unknown	REL12	-	1
Promise-keeping	REL17	+	1
Lack of experience	REL19	-	1
Management team lack of knowledge	REL21	-	1
Perceived satisfaction of partners' expectations	REL26	-	1
Reliability	REL27	+	1
TOTAL			**132**

Table 15 (Cont'd): Key Partnering Driver Constructs and Variables.

PROCESS ORIENTED	VARIABLE	RELATIONSHIP	TOTAL
Top management commitment/support	PROC69	+	20
Effective communication	PROC19	+	16
Open communications	PROC47	+	16
Workshops	PROC72	+	14
Early involvement of designer / contractor / subcontractors	PROC17	+	13
Regular monitoring of partnering process (Benchmarking)	PROC54	+	12
Team building session	PROC68	+	11
Free flow of information	PROC27	+	10
Facilitator / Partnering champion / Neutral third party	PROC23	+	8
Lack of training and guidance in the arrangement	PROC39	-	8
Clear understanding of objectives	PROC03	+	7
Commitment to continuous improvement	PROC05	+	7
Long-term relationships	PROC43	+	6
Clear definition and lines of responsibility	PROC02	+	5
Integrated information systems	PROC30	+	5
Problem resolution process	PROC48	+	5
Problem-solving process	PROC49	+	5
Adopt Alternative Dispute Resolutions (ADR)	PROC01	+	4
Creativity and innovation	PROC12	+	4
Formation at design stage	PROC26	+	4
Long-term commitment	PROC41	+	4
More frequent meetings	PROC46	+	4
Respect and appreciation of the system	PROC58	+	4
Total cost perspective	PROC70	+	4
Commitment to quality	PROC06	+	3
Flexibility to change	PROC25	+	3
Lack of appropriate information technology	PROC35	-	3
Lack of empowerment in client's representatives	PROC36	-	3
Long-term perspective	PROC42	+	3
Questioning attitudes	PROC51	+	3
Conflict identification and resolution strategy	PROC07	+	2
Consultants used	PROC08	+	2
Effective coordination	PROC10	+	2
Failure to compromise	PROC11	-	2
Design criteria established early on	PROC14	+	2
Eliminating non-value added activities / value engineering	PROC21	+	2
Establishment and communication of conflict resolution strategy	PROC22	+	2
Joint problem solving	PROC33	+	2
Joint project office	PROC34	+	2
Lack of supply chain partnering	PROC37	-	2
Lack of top management support	PROC38	-	2
Learning climate	PROC40	+	2
Low commitment of partners	PROC44	-	2
Provisions for continuous improvement	PROC50	+	2
Risk allocation	PROC53	+	2
Resource sharing and open books	PROC59	+	2
Reward system for meeting objectives	PROC60	+	2

Table 15 (Cont'd): Key Partnering Driver Constructs and Variables.

PROCESS ORIENTED	VARIABLE	RELATIONSHIP	TOTAL
Target cost set early	PROC67	+	2
Cost driven	PROC09	+	1
Design / supplier based onsite	PROC13	+	1
Detailed plan for operating critical path	PROC15	+	1
Early implementation	PROC16	+	1
Education and training	PROC18	+	1
Effective process for change orders	PROC20	+	1
Fear of micromanagement	PROC24	-	1
Funding plan	PROC28	+	1
Holding design information in common	PROC29	+	1
Involvement of participants in design process	PROC31	+	1
Joint business planning	PROC32	+	1
Closer links between demand/supply	PROC04	+	1
Manpower development	PROC45	+	1
Quick decision making	PROC52	+	1
Relationships are effectively managed	PROC55	+	1
Reliable cost data	PROC56	+	1
Reluctance to commit extra resources	PROC57	-	1
Schedule management on milestones	PROC61	+	1
Selection of items for early procurement	PROC62	+	1
Shared resources	PROC63	+	1
Standardized resources	PROC64	+	1
Staff continuity and availability	PROC65	+	1
Strategy for checking resources / facilities	PROC66	+	1
Work processes established to achieve discipline and goals	PROC71	+	1
TOTAL			**274**

APPENDIX E: EXTERNAL MODERATOR CONSTRUCT AND VARIABLES

Table 16: External Moderator Construct and Variables.

EXTERNAL MODERATORS	VARIABLE	RELATIONSHIP	TOTAL
Bureaucratic public client organization	EXT01	-	6
Stringent public rules, regulations and laws	EXT10	-	4
Conservative industry culture inhibits changes (status quo)	EXT04	-	3
Client only has occasional need for project development	EXT02	-	2
Need to avoid allegations of corruption	EXT07	-	2
Public sector accountability concerns	EXT08	-	2
Commercial pressures comprised partnering attitude	EXT03	-	1
Flexibility restricted by bidding approach	EXT05	-	1
Local labor and community benefits	EXT06	-	1
Public sentiments	EXT09	-	1
TOTAL			**23**

APPENDIX F: PERFORMANCE OUTCOME CONSTRUCTS AND VARIABLES

Table 17: Performance Outcome Constructs and Variables.

COST PERFORMANCE	VARIABLE	TOTAL
Meeting budget cost targets	COSTP11	10
Cost savings	COSTP03	7
Reduce additional expenses	COSTP16	6
Claims cost percent of original cost	COSTP04	5
Increased opportunity for innovation (Cost Savings)	COSTP07	4
Cost growth per change order	COSTP02	3
Liquidated damage cost as percent of total cost	COSTP09	3
Reduce total project cost	COSTP19	3
Reduced cost	COSTP21	3
Reduced paperwork	COSTP22	3
Change order cost	COSTP01	2
Dispute cost percent of original cost	COSTP05	2
Improve cost savings for client	COSTP06	2
Liquidated damage cost as percent of change order	COSTP08	2
Maximize resource utilization	COSTP10	2
Number of change orders	COSTP12	2
Percent cost growth per change order	COSTP13	2
Percent of projects with deducts	COSTP14	2
Percent of projects with liquidated damages	COSTP15	2
Reduce cost of changing partner in project	COSTP17	2
Reduce public client's admin burden	COSTP18	2
Reduced admin cost - defensive case building	COSTP20	1
Value engineering savings	COSTP23	1
TOTAL		**71**

SCHEDULE PERFORMANCE	VARIABLE	TOTAL
Meeting schedule targets	SCHP06	12
Reduce time in delivering the project	SCHP09	6
Better productivity	SCHP01	5
Project schedule growth	SCHP08	4
Time variance	SCHP11	3
Improved construction time	SCHP02	2
Integrated solutions to improve efficiency	SCHP04	2
Liquidated damage percent of total contract days	SCHP05	2
Percent of additional days granted	SCHP07	2
Improved productivity	SCHP03	1
Time	SCHP10	1
TOTAL		**40**

Table 17 (Cont'd): Performance Outcome Constructs and Variables.

QUALITY / SAFETY PERFORMANCE	VARIABLE	TOTAL
Improve the quality of project	QUALP10	14
Environmental issue complaints	QUALP06	5
Increase client satisfaction	QUALP13	5
Reduce wasted work or re-work	QUALP17	5
Improve design	QUALP08	4
Improve non-conformance reports	QUALP09	3
Improved safety performance	QUALP11	3
Incident rate	QUALP12	3
Achieve better safety performance	QUALP01	2
Customer needs	QUALP04	2
Increased customer satisfaction	QUALP15	2
Quality improvements	QUALP16	2
Safety	QUALP20	2
Better quality design	QUALP02	1
Better workmanship	QUALP03	1
Design cycle reductions	QUALP05	1
Improve collaboration in design	QUALP07	1
Increase safety performance	QUALP14	1
Reduced engineering rework	QUALP18	1
Reduced variations	QUALP19	1
TOTAL		**59**

DISPUTE / LITIGATION PERFORMANCE	VARIABLE	TOTAL
Reduce disputes	DISPP03	10
Claim and issue resolution	DISPP01	7
Reduced litigation	DISPP04	7
Improved conflict resolution strategies	DISPP02	3
Reduced risk exposure	DISPP05	3
Reduction in monetary claims	DISPP06	1
Reduced time to resolve claims	DISPP07	1
TOTAL		**32**

Table 17 (Cont'd): Performance Outcome Constructs and Variables.

PROCESS PERFORMANCE	VARIABLE	TOTAL
Improved relationship for project participants	PROCP07	16
Long-term trust	PROCP17	10
Improved communications	PROCP06	9
Continuous improvement increased	PROCP03	6
Win-win attitude	PROCP20	5
Less adversarial relationship	PROCP16	4
Better teamwork	PROCP02	3
Joint satisfaction for project participants	PROCP15	3
More flexibility to changes	PROCP19	3
Better decision making	PROCP01	1
Decrease micromanagement	PROCP04	1
Improved administration	PROCP05	1
Increased involvement of user and end customer	PROCP08	1
Increased equality and fairness	PROCP09	1
Increased openness and honesty	PROCP10	1
Increased participation	PROCP11	1
Increased subcontractor contributions to innovation and problem solving	PROCP12	1
Increased support for innovation and improvements	PROCP13	1
Improved commitment	PROCP14	1
Lower level decision making	PROCP18	1
TOTAL		**70**

Table 17 (Cont'd): Performance Outcome Constructs and Variables.

ORGANIZATIONAL PERFORMANCE	VARIABLE	TOTAL
Improved profit margins	ORGP14	8
Enhance organization's reputation in industry	ORGP04	7
Improved corporate culture	ORGP13	7
Opportunity to continuously access additional projects	ORGP19	6
Build closer relationships with parties	ORGP03	5
Achieve continuity with prior developments	ORGP01	4
Improve organization's competency	ORGP09	4
Improve long-term competitive advantage	ORGP10	4
Seize new market opportunities	ORGP23	4
Shared risk	ORGP25	4
Respond to collaborative culture	ORGP20	3
Facilitate creative and innovative approaches	ORGP05	2
Increase bidding advantage	ORGP08	2
Increased market share	ORGP15	2
Obtain support of partner's expertise and knowledge	ORGP18	2
Respond to competitors' actions	ORGP21	2
Respond to technology changes	ORGP22	2
Technical performance	ORGP26	2
Assure financing	ORGP02	1
Good public relations	ORGP06	1
Greater certainty to the contractor	ORGP07	1
Improve social responsibilities	ORGP11	1
Improved life-cycle cash flow	ORGP12	1
Individuals' job satisfaction	ORGP16	1
Meet local government/trade/project requirements	ORGP17	1
Serve core customers	ORGP24	1
TOTAL		**78**

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