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RESEARCH NOTE

LOOKING TOWARD THE FUTURE OF IT–BUSINESS STRATEGIC ALIGNMENT THROUGH THE PAST: A META-ANALYSIS[1]

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Research examining the relationship between IT–business strategic alignment (hereafter referred to as alignment) and firm performance (hereafter referred to as performance) has produced apparently conflicting findings (i.e., an alignment paradox). To examine the alignment paradox, we conducted a meta-analysis that probed the interrelationships between alignment, performance, and context constructs. We found the alignment dimensions (intellectual, operational, and cross-domain) demonstrate unique relationships with the different performance types (financial performance, productivity, and customer benefit) and with many of the other constructs in alignment's nomological network. All mean corrected correlations between dimensions of alignment and dependent variables were positive and most of the credibility interval values in these analyses were also positive. Overall, the evidence gathered from the extant literature suggests there is not much of an alignment paradox. This study contributes to the literature by clarifying the relationships between alignment and performance outcomes and offering insight into sources of inconsistencies in alignment research. By doing so, this paper lays a foundation for more consistent treatment of alignment in future IT research.

Keywords: Alignment, business–IT strategic alignment, alignment paradox, IT value, productivity paradox, meta-analysis, review

Introduction

For 30 years, information technology (IT) executives have identified IT–business strategic alignment as a top management concern (Guillemette and Pare 2012; Kappelman et al. 2013). Responding to this continuing concern of practice, scholars have directed attention to understanding how aligning business and IT generates value for firms (as one of the earliest examples, see King 1978; as one of the more recent examples, see Masa'deh and Shannak 2012). On the one hand, cultivating alignment between business and IT strategies could increase profitability and generate a sustainable competitive advantage (Baker et al. 2011; Sabegh and Motlagh 2012). On the other hand, failure to align could result in wasted resources and failed IT initiatives leading to adverse financial and organizational outcomes (Chen et al. 2010; Ravishankar et al. 2011). Due to alignment's persistent nature and potential implications, practitioners and scholars alike have considered alignment a priority for firms (Chan and Reich 2007; Kappelman et al. 2013).

[1]Soon Ang was the accepting senior editor for this paper. Christine Koh served as the associate editor.

Consequently, practitioners have devoted substantial attention to identifying how CIOs may foster alignment and generate value for the firm. For example, publications such as *CIO Magazine* have topical pages[2] and blogs[3] dedicated to alignment that continually direct attention to the subject (e.g., Moore 2012). Additionally, practitioner books focus on innovation and efficiencies derived from alignment such as improved decision making, automation of internal business processes, or improving customer satisfaction (e.g., Margolies et al. 2013). Practitioners report alignment is a means to develop firms' competitive capabilities, such as improving work-flow and incorporating IT into strategic thinking (e.g., Bickel 2012).

Consistent with the practitioner literature, academics frequently emphasize alignment's positive aspects in theoretical frameworks and empirical research. Alignment research generally focuses on firm performance (e.g., Rivard et al. 2006) such as increased sales revenue (e.g., Kearns 2005), improved operational efficiency (e.g., Oh and Pinsonneault 2007), cost reductions (e.g., Johnson and Lederer 2010), and enhanced customer value (e.g., Celuch et al. 2007). Research suggests "aligned" firms are more likely to invest in IT and allocate resources to projects tied to overall business objectives (e.g., Cumps et al. 2009). Because aligned firms effectively use IT resources, research often finds that they leverage IT to respond to and exploit opportunities in the market, increase profitability, and create a sustainable competitive advantage (e.g., Cumps et al. 2009).

However, some research has found aligned firms report no improvement, or even a decline, in performance (i.e., an *alignment paradox*) (e.g., Tallon 2003). These studies suggest alignment can lead to stagnation, strategic inflexibility, and competitive disadvantage (e.g., Chen et al. 2010). Consequently, some argue alignment may result in too rigid a firm, where tight links between business and IT restrict the firm's ability to recognize change, reduces its strategic flexibility, and inhibits its ability to respond to environmental change (e.g., Benbya and McKelvey 2006). This view suggests some firms find themselves in a "rigidity trap" because the alignment process is too time-consuming, costly, and formal to enable quick responses to changing market conditions (e.g., Chen et al. 2010). This problem becomes most apparent in firms that too narrowly customize IT systems to meet current strategic needs, resulting in an inflexible infrastructure that does not reflect standards and is costly to update (e.g., Shpilberg et al. 2007).

[2]http://www.cio.com/topic/3155/Alignment.

[3]http://blogs.cio.com/businessmanagement-topics/it-organization/alignment.

In summary, despite enthusiasm for alignment in industry, academic research suggests alignment may lead to positive or negative outcomes for firms. This paradox is problematic because without getting a good understanding of the effectiveness of alignment, theoretical development on the alignment construct cannot advance. There are a variety of alignment definitions, multiple factors related to alignment, as well as various approaches to measuring alignment. We would like to take stock of the considerable empirical investment in this area and to consolidate findings in a manner that can facilitate future theoretical work. This is particularly important given alignment's potential positive outcomes and ongoing practitioner interest. As such, our broad objective is *to understand whether alignment leads to firm performance*. In this research note, we focus on the important task of consolidating empirical results by emphasizing analysis and results; we leave theoretical explanation to future study (for support on the idea that it is acceptable to present interesting results to guide future theory development, see Hambrick 2007).

To meet our objective, we meta-analyze alignment's nomological network. First, we define the constructs in alignment's nomological network. Then, we describe our data collection and coding procedures, evaluate the magnitude of the relationships between alignment and other constructs in alignment's nomological network, and use moderator analysis to probe whether variation across studies is the result of methodological issues. We conclude the paper with a discussion of the findings of our meta-analysis, present their implications for research and practice, and highlight opportunities for future research.

Factors Examined in Alignment Research

Alignment and Its Dimensions

Alignment is defined as "the degree to which the needs, demands, goals, objectives, and/or structures of one component are consistent with the needs, demands, goals, objectives, and/or structures of another component" (Nadler and Tushman 1983, p. 119). IT strategy researchers have specifically examined alignment of four business and IT components—business strategy, IT strategy, business infrastructure and processes, and IT infrastructure and processes—to help realize the full potential of information technology (e.g., Henderson and Venkatraman 1999). Hence, *IT-business strategic alignment* refers to the fit between two or more of these components in terms of addressing the needs, demands, goals, objectives, and/or structures of each component such that management of the business and IT remain in harmony (Chan and Reich 2007; Luftman and Brier 1999).

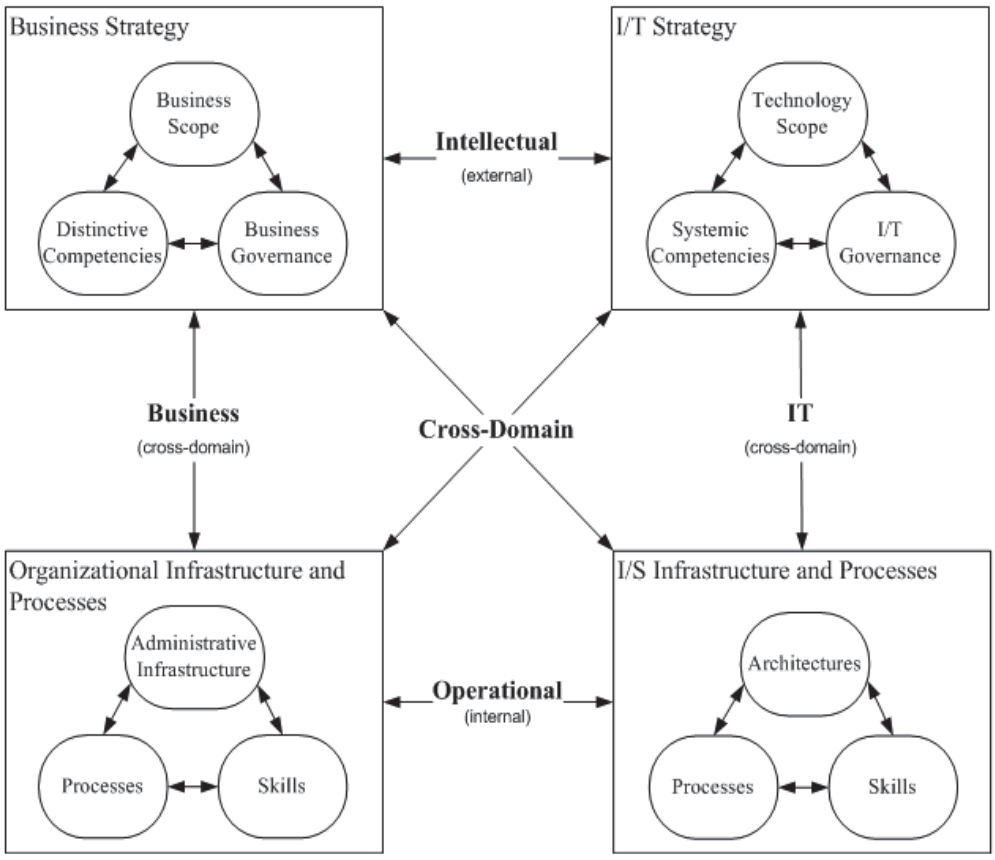

Figure 1. Henderson and Venkatraman's Strategic Alignment Model (Source: "Strategic Alignment: Leveraging Information Technology for Transforming Organizations," J. C. Henderson and H. Venkatraman, *IBM Systems Journal* (38:2/3), 1999, p. 476. Used with permission.)

The alignment literature can be summarized using the strategic alignment model (SAM), as illustrated in Figure 1. SAM displays a firm's need to integrate the business and IT domains at three levels: strategies (i.e., external integration), infrastructures (i.e., internal integration), and strategies and infrastructures (i.e., cross-domain integration) (Henderson and Venkatraman 1999). External integration reflects the alignment of business and IT strategies; this type of alignment is referred to as strategic or *intellectual alignment* (Chan and Reich 2007; Reich and Benbasat 1996, 2000) and is defined as "the degree to which the mission, objectives, and plans contained in the business strategy are shared and supported by the IS strategy" (Chan et al. 2006, p. 27). Internal integration is the alignment between the business and IT infrastructures and processes; this type of alignment is referred to as *operational alignment* and is defined as "the link between organizational infrastructure and processes and I/S infrastructure and processes" (Henderson and Venkatraman 1999, p. 476). Finally, cross-domain integration recognizes alignment potentially transcends the domains where strategies can be aligned with infrastructures and processes; Henderson and Venkatraman (1999) refer to this as a "recognition of multivariate relationships" (p. 477) or *cross-domain alignment*, which is defined as "the degree of fit and integration among business strategy, IT strategy, business infrastructure, and IT infrastructure" (Chan and Reich 2007, p. 300).

Three Types of Firm Performance

In evaluating performance, we used outcomes identified by Hitt and Brynjolfsson (1996) and Tallon et al. (2000); they defined performance in terms of three over-arching types: financial performance, productivity, and customer benefit. Financial performance refers to the firm's ability to "gain competitive advantage and therefore higher profits or stock values" (Hitt and Brynjolfsson 1996, p. 123). Second, productivity refers to the measure of the contribution of various

inputs to total outputs (e.g., gross marginal product, gross margin per employee) (Hitt and Brynjolfsson 1996; Raymond and Bergeron 2008). Finally, customer benefit is "the total benefit that a given purchase confers to consumers" (Hitt and Brynjolfsson 1996, p. 124).

Other Contextual Variables Commonly Studied in the Alignment Literature

We found alignment researchers commonly study five variables in addition to alignment and performance: environmental turbulence, strategy, governance structure, social alignment, and IT investments. These contextual variables are discussed in the following paragraphs.

First, environmental turbulence includes such concepts as environmental uncertainty, information intensity, and transformative industry behaviors and is defined as the degree of uncertainty, instability, unpredictability, and complexity that exists in the external environment (Teo and King 1997). In general, studies posit environmental turbulence impacts the firm's ability to align strategies (e.g., Bergeron et al. 2001; Chang et al. 2008; Huang 2009). However, some researchers have found environmental turbulence does not always influence alignment (e.g., Kearns and Lederer 2004; Teo and King 1997), while others revealed environmental uncertainty resulted in different levels of alignment (e.g., Choe 2003; Kearns and Lederer 2004; Wang et al. 2011).

Second, strategy is defined as "the determination of the basic long-term goals of an enterprise, and the adoption of courses of action and allocation of resources necessary for carrying out these goals" (Chandler 1962, p. 13). Miles and Snow's (1978) defenders, prospectors, and analyzers typology is often used as the strategic framework. Each strategy captures the firm's emphasis on product stability and operational efficiency (i.e., defenders), innovation and flexibility (i.e., prospectors), or product stability mixed with innovation (i.e., analyzers). Several studies utilizing this typology have found analyzers and prospectors value aligning business and IT strategies while defenders do not (Chan and Reich 2007; Croteau and Bergeron 2001). This indicates that alignment may be contingent on firm strategy, with higher levels of alignment for some firms (e.g., analyzers and prospectors) but not others (e.g., defenders) (also see Chan et al. 2006; Palmer and Markus 2000; Raymond and Croteau 2006).

Third, governance structure includes concepts such as the structural compatibility and the structure of authority in the organization (Johnston and Yetton 1996; Kang et al. 2008) and is "characterized by [a firm's] level of decentralization, formalization, and complexity" (Bergeron et al. 2001, p. 130). Research indicates governance structure impacts alignment (e.g., Bergeron et al. 2001, 2004; Lee et al. 2008; Oh and Pinsonneault 2007; Yayla 2008). For instance, some research has found centralization is necessary for alignment success (Kang et al. 2008); yet other research indicates successful alignment is possible with centralized, decentralized, or even hybrid structures (Brown and Magill 1998). While it remains unclear what type of structure positively impacts alignment, research does indicate the level of alignment depends on the firm's structure.

Fourth, social alignment refers to "the state in which business and IT executives within an organizational unit understand and are committed to the business and IT mission, objectives, and plans" (Reich and Benbasat 2000, p. 82). Through social alignment, firms have the ability to develop and share knowledge, understanding, and commitment between business and IT such that the two can be integrated or aligned with each other (Armstrong and Sambamurthy 1999; Bassellier and Benbasat 2004; Broadbent et al. 1999). In particular, firms that participate in knowledge sharing between business and IT uncover one of the most valuable assets of an organization such that IT-based opportunities arise and the firm produces superior alignment strategies (Celuch et al. 2007; Kearns and Lederer 2003; Taipala 2008).

Finally, IT investments are defined as the amount of money firms spend on their IT infrastructure (including IT spending for employees) (e.g., Byrd et al. 2006; Celuch et al. 2007). Some researchers argue IT investments alone cannot drive firm performance; instead, these investments should be used to support and enable the business (i.e., alignment) in order to drive firm performance (Byrd et al. 2006; Kearns and Lederer 2004; Schwarz et al. 2010). This is potentially important because IT investments are equally available to all firms and often cannot convey a competitive advantage (Carr 2003; Kearns and Lederer 2003; Oh and Pinsonneault 2007). However, once embedded in the organizational structure, firms can use their IT investments to create, maintain, and improve IT capabilities necessary to establish alignment (Peppard and Ward 2004; Tallon 2000; Xue et al. 2012) and, over time, use their alignment capabilities to more effectively apply their IT resources (Armstrong and Sambamurthy 1999; Byrd et al. 2006).

Table 1 provides a summary of these constructs and their definitions.

Methodological Moderators

Methodological moderators may explain variation across the studies because they potentially explain the inconsistent rela-

Table 1. Definitions for Constructs in Alignment's Nomological Net

Construct	Definition
Environmental Turbulence	the degree of uncertainty, instability, unpredictability, and complexity that exists in the external environment (Teo and King 1997)
Strategy	"the determination of the basic long-term goals of an enterprise, and the adoption of courses of action and allocation of resources necessary for carrying out these goals" (Chandler 1962, p. 13)
Governance Structure	a firm that is "characterized by its level of decentralization, formalization, and complexity" (Bergeron et al. 2001, p. 130)
Social Alignment	"the state in which business and IT executives within an organizational unit understand and are committed to the business and IT mission, objectives, and plans" (Reich and Benbasat 2000, p. 82)
IT Investments	the amount of money a firm spends on technology

Table 2. Moderator Definitions

Moderator	Definition
Respondent Type	
Single Respondent	one individual responds on behalf of the organization
Matched Pairs	two individuals respond to the survey[†]
Measure of Alignment	
Single Measure	survey items are directed at collecting perceptions about alignment
Fit Model	survey items and/or interview questions are designed to collect information on the IT and business strategy of the firm so alignment can be determined through moderation, mediation, matching, covariation, profile deviation, or gestalt approaches

[†]Some of the matched pairs studies included surveys where both respondents answered the same questions and an average response was calculated (e.g., Preston and Karahanna 2009) but most had separate questions for the individual respondents where the most knowledgeable respondent could address the appropriate questions (e.g., only the plant manager answered questions about performance in the study by Byrd et al. 2006).

tionship between alignment and firm performance (Hunter and Schmidt 2004). We address two commonly referenced methodological issues that may contribute to conflicting results and, therefore, confusion in interpreting the alignment literature: respondent type and measure of alignment (Cragg et al. 2002; Kearns and Sabherwal 2006; Tallon 2007) (see Table 2). By including these variables as moderators in our meta-analysis, we will be able to assess whether they explain variation across studies (i.e., help address these conflicting results) (Hunter and Schmidt 2004).

We include respondent type as a moderator due to the debate over single respondent versus matched CIO/CEO pairs, which is a regularly cited limitation in the alignment literature. On the one hand, research indicates matched pairs are superior to single respondents because the researcher can capture both sides of the dyad (Croteau and Raymond 2004; Kearns and Sabherwal 2006). Also, researchers frequently acknowledge that using single respondents creates common method bias (e.g., Armstrong and Sambamurthy 1999; Jarvenpaa and Ives 1993; Kearns and Sabherwal 2006; Lai et al. 2009). While this concern can be addressed by using multiple respondents in the same firm (Teo and King 1996), collecting data from two sources at the executive level is difficult (Chan et al. 1997) and can compromise the anonymity of the questionnaire (Kearns and Sabherwal 2006). Additionally, matched pairs may result in subjectivity and measurement error (Tallon 2007). Since the effect of additional bias from the use of single respondents is a potential problem, we predict using single respondent types, as opposed to matched pair respondent types, will be associated with larger estimates for the correlation between the alignment dimensions and the performance types.

We include choice of instrument as a moderator because the measurement approach can yield different meanings of the theory and can generate inconsistent results (Bergeron et al. 2001; Powell 1992).[4] Although mathematical calculations,

[4]We also considered the use of established scales as a moderator of "measure of alignment." However, our analysis revealed only about a quarter of empirical alignment researchers used established scales like Venkatraman's (1985) STROBE (STRategic Orientation of Business Enterprises) and/or Chan et al.'s (1997) STROEPIS (STRategic Orientation of the Existing Portfolio of Information Systems) (e.g., Bergeron et al. 2004; Chan et al. 2006; Sabherwal and Chan 2001), Luftman's (2000) Strategic Alignment Maturity Model (e.g., Dorociak 2007; Khaiata and Zualkernan 2009; Luftman

typologies, taxonomies, and qualitative assessment approaches appear in the alignment literature, single measures and fit models are the predominant instruments used to operationalize alignment (a total of 49 and 22 empirical studies in our analysis used one of these two measures of alignment, respectively). For studies using single measures, researchers often use Likert scale questions so respondents can rate their perceptions of alignment in their organization. For fit model studies, the IT and business strategies are measured independently and then a composite index is created by aggregating these components (Oh and Pinsonneault 2007) using at least one of the six types of fit: moderation, mediation, matching, gestalts, profile deviation, or covariation (as discussed by Venkatraman (1989) and tested by Bergeron et al. (2001)). Fit measures of alignment may be more objective because alignment itself is not determined by the perceptions of the respondents. Nevertheless, using fit models has been criticized because they result in contradictory, mixed, or inconsistent results based on the perspective of fit chosen by the researcher (Bergeron et al. 2004) and for over-simplifying the complex and reciprocal relationships among the variables in question (Oh and Pinsonneault 2007). Single measures are more strongly based on perceptual measures in comparison to objective calculations and may be less rigorous for evaluating alignment (i.e., in fit models) (Cragg et al. 2002). Thus, we believe the results may be upwardly biased for single measures (i.e., larger corrected population correlation point estimates) when the results are compared to fit models (Podsakoff et al. 2003).

Meta-Analysis

Meta-analysis is a statistical technique designed to systematically combine the results from empirical studies that address similar research questions (Glass 1981; Hunter and Schmidt 2004; Lipsey and Wilson 2001). Specifically, we used meta-analysis to mathematically cumulate the results of previous studies on alignment. We briefly outline the advantages of meta-analysis for addressing our research questions on alignment.

First, traditional narrative reviews have often worked poorly in the past because they are "inadequate to integrate conflicting findings across large numbers of studies" (Hunter and Schmidt 2004, p. 16) due to the limitations of human information processing. Instead, a meta-analysis allows a mathematical combination of correlations between two (or more) variables. In this case, we analyzed the correlations between alignment dimensions and variables such as the firm performance types (i.e., financial performance, productivity, and customer benefit), social alignment, environmental turbulence, etc., where differences may help identify moderator variables (i.e., boundary conditions).

Second, meta-analysis enables the mathematical correction of certain types of research design flaws and methodological factors that may have obscured the alignment–performance relationship. For example, meta-analysis enables the examination of sampling error, facilitates correcting measurement reliability, and "enables the quantitative examination of the impact of moderator variables on the results" (Stewart and Roth 2001, p. 147). Additionally, it facilitates the analysis of data that would normally be "wasted" due to low sample size or insignificant results that were insufficient for publication (Rosenthal and DiMatteo 2001, p. 64).

Method

Sources of Data

Following Webster and Watson (2002) and the techniques of Hunter and Schmidt (2004), we began our literature review using a keyword search in various electronic databases (e.g., Science Direct, Web of Science, Academic Search Premier, Business Source Premier, ACM Digital Library) to identify published studies on IT–business alignment through June 2013 (see Figure 2 for a workflow diagram of the entire meta-analysis procedure). Conference proceedings, dissertations, and theses were included in the search to address bias toward higher effect sizes typically associated with published journal articles (Rosenthal 1979); therefore, we also included the AIS Electronic Library (to collect AIS conference proceedings) and the ProQuest Dissertations & Theses database in our search. To ensure we captured all relevant articles, we also conducted a manual search of leading IT and business journals that were outlets for alignment research; we used our library's Interlibrary Loan (ILL) system to collect articles from other universities; we used citations in the articles we "pulled" to identify additional alignment articles; we used Harzing's Publish or Perish, Google Scholar, and the Web of Science Cited Reference Search to identify articles that referenced papers we had already identified; and we e-mailed all the authors in our list of papers to see if they had additional correlation tables that had not been published.[5] We systematically searched these sources for alignment and other related

et al. 2008), Segars and Grover's (1998) alignment items (e.g., Kearns and Sabherwal 2006; Newkirk and Lederer 2006b; Yayla and Hu 2009), or Miles and Snow's (1978) categories (e.g., Karimi et al. 1996; Raymond and Bergeron 2008). As such, we were unable to perform a sufficient moderator analysis using these established scales.

[5]We received responses from 92 authors (54.76%). Of these, two authors provided papers that were added to the review.

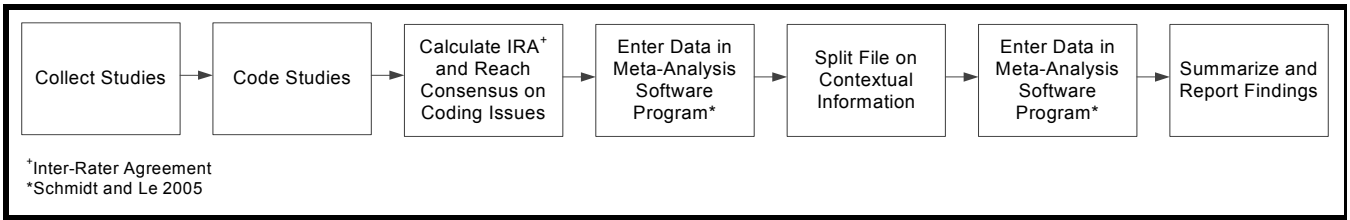

Figure 2. Workflow of the Meta-Analysis Procedure

terms (Avison et al. 2004) including alignment, strategic alignment (Chan et al. 2006; Kearns and Sabherwal 2006), linkage or linking (Tavakolian 1989), fit (Bergeron et al. 2001), integration (Teo and King 1997; Weill and Broadbent 1998), coordination (Lederer and Mendelow 1989), coalignment (Wang and Tai 2003), bridge (Avison et al. 2004), harmony (Luftman et al. 1999; Tallon 2007), and fusion (Smaczny 2001). Of the articles we identified, we developed a rigorous set of inclusion criteria to evaluate their usefulness for our meta-analysis.

Inclusion Criteria

Four inclusion criteria were used to assess articles. First, the study had to use at least one dimension of strategic alignment as defined by Henderson and Venkatraman (1999) (see the Appendix for a full categorization of all the studies included in our meta-analysis). Eight studies did not meet this inclusion criterion.

Second, the study's unit of analysis had to be at the firm level. Studies at the business unit, individual, project, relationship, or system unit of analysis were excluded (e.g., Avison et al. 2004). Twelve studies did not meet this inclusion criterion.

Third, the study had to provide a correlation between alignment and one of our other variables. Articles that reviewed the alignment literature or were conceptual in nature were dropped (e.g., Aerts et al. 2004). For empirical articles, we looked for zero-order correlations in the article. If these correlations were not presented in the article, we first looked for other analyses suggesting correlation tables might be available (e.g., regression, path analysis). If these other analyses were presented in the article, we e-mailed the authors to obtain the required correlations (we e-mailed 17 authors).[6] If the study did not present this information or the author could not provide the correlations, it was excluded from further examination. A total of 99 articles were excluded based on this criterion.

[6]Two authors responded with correlation tables (Lee et al. 2004; Luftman et al. 2008).

Finally, the article had to provide an independent dataset. This means any earlier articles containing the same dataset were eliminated to avoid biasing the study through multiple-counting (Bobko and Roth 2003; Wood 2008) (e.g., Newkirk et al. 2003). However, one journal article could contribute more than one set of correlation coefficients if independent datasets were used (e.g., Taipala (2008) contributed two data sets).

This resulted in a total of 71 papers, or 78 individual datasets, for the meta-analysis; this is indicated by the reporting of sample sizes in the Appendix where 6 papers included 2 or more studies. Of these papers, 53 were journal articles, 11 were dissertations, and 7 were conference papers. This is a large sample size compared to other firm-level meta-analyses in the top MIS journals (e.g., Lee and Xia's (2006) meta-analysis contained 21 empirical studies, Sharma and Yetton (2003) included 22 studies, and Kohli and Devaraj (2003) analyzed 66 studies) and other top management journals such as *Management Science* (e.g., VanderWerf and Mahon's (1997) meta-analysis included 22 studies).

Coding Procedure

Beyond collecting basic article information (e.g., author, year, article-type), we also coded the type of alignment, relevant statistics (e.g., correlations, reliabilities, and sample sizes), and methodological moderators. The type of alignment was coded based on the definitions we presented for intellectual (Chan and Reich 2007; Reich and Benbasat 1996, 2000), operational (Cragg et al. 2007; Henderson and Venkatraman 1999), and cross-domain (Chan and Reich 2007) alignment. For reliabilities, we coded internal consistency reliabilities (ICR) such as Cronbach's alpha.

The methodological moderators included respondent type and measure of alignment. For respondent type, we coded the article as a "single respondent" when only one individual responded on behalf of the entire organization. If two or more individuals responded to the survey from within the same organization or department, then the study was coded as a "matched pair." For measure of alignment, we coded two

categories: "fit model" or "single measure" (Chan and Reich 2007). The study was coded as a fit model when the subjects did not directly address their perceptions of alignment and only rated IT and business strategies separately (often through a questionnaire; e.g., Byrd et al. 2006; Chan et al. 2006; Sabherwal and Chan 2001) such that alignment was conceptualized as moderation, mediation, matching, gestalts, profile deviation, or covariation (as discussed by Venkatraman 1989). Conversely, if the researcher posed a Likert scale question to directly capture the respondents' perceptions of alignment in their organization, the study was coded as a single measure of alignment. The codings for respondent type and measure of alignment were not mutually exclusive. For example, a study could have one individual respond to the business strategy questions and another individual respond to the IT strategy questions (i.e., matched pair and fit model), one individual could address individual business strategy and IT strategy questions (i.e., single respondent and fit model), two individuals could independently rate alignment (i.e., matched pair and single measure), or one individual could address the firm's alignment (i.e., single respondent and single measure).[7]

Meta-Analytic Approach

We used the Hunter-Schmidt approach to meta-analysis (Hunter and Schmidt 2004). This approach is a random-effects model. This technique uses coding and statistical-psychometric procedures to combine the results from independent, empirical studies that address similar research questions (for a discussion of this technique see Glass 1981; Hunter and Schmidt 2004; Lipsey and Wilson 2001).

After all of the papers were collected and coded by the lead author, we had three independent raters code 10 different, randomly selected papers (i.e., a total of 30 papers were coded by three individuals) to ensure our heuristics were appropriate and coding was accurate. The inter-rater agreements were 97.7 percent, 96.4 percent, and 95.1 percent. Disagreements were discussed among the coders, and the coding heuristics were updated to address any inconsistencies.

Once coding was complete, we grouped the alignment and performance constructs for each study. Some studies included multiple measures of a construct in their study (e.g., Armstrong and Sambamurthy 1999; Kearns and Lederer 2000). For those studies, we created a composite correlation using Hunter and Schmidt's (2004) formula and a composite reliability using Mosier's (1943) formula.

We then ran the analysis using the Schmidt-Le program (2005). Our estimates were corrected for measurement error to minimize downwardly biased population correlation point estimates (i.e., estimates that are too small) (Hunter and Schmidt 2004). To do so, we corrected the correlations for unreliability by using an artifact[8] distribution from our database of internal consistency measures of reliability (Hunter and Schmidt 2004). By using internal consistency measures, our results reflected a conservative correction of the correlations (Hunter and Schmidt 2004). Therefore, our corrected population correlation point estimate reflects the cumulative empirical evidence researchers have collected on alignment without the "artifacts that produce the illusion of conflicting findings" (Hunter and Schmidt 2004, p. 17).

We placed the credibility and confidence intervals around the corrected population correlation point estimates. The credibility intervals refer to the parameter value distributions where 80 percent of the $\hat{\rho}$-values fall within that interval, and the confidence intervals refer to the estimates of the mean $\hat{\rho}$-value (Hunter and Schmidt 2004). Credibility intervals are critically linked to random-effects meta-analysis models like ours because they allow for potential parameter variation across studies, while confidence intervals provide additional information about any uncertainty that surrounds the mean corrected population correlation point estimate (Hunter and Schmidt 2004). Credibility intervals that overlap indicate some $\hat{\rho}$-values overlap between the two distributions. Overlapping confidence intervals suggest the level of uncertainty in estimating the mean values makes it difficult to be sure the mean values from two groups of studies (e.g., moderator values) are notably different; confidence intervals that do not overlap provide confirmation that the two mean effect sizes are likely different (Hunter and Schmidt 2004). When confidence intervals do not cross zero, the estimate is thought to be statistically significant at $p < 0.05$ by some researchers (Whitener 1990).[9]

We computed the percent of variance in correlations across studies attributable to sampling and measurement error. Then, we combined these factors to illustrate how much of the variability in corrected population correlation point estimates was due to these artifacts. For the moderator analysis, we first partitioned the data into individual subgroups based on the categories presented in Table 2.

[7]Number of studies in each quadrant: matched pair-fit model = 9; single respondent-fit model = 13; matched pair-single measure = 11; single respondent-single measure = 38.

[8]*Artifact* refers to sampling and measurement errors here and throughout this section.

[9]Thank you to an anonymous reviewer for providing this citation and suggesting this reference to significance testing.

Results

The results of our meta-analysis are shown in Table 3.

These results suggest intellectual and operational alignment ($\hat{\rho}$ = 0.72) and intellectual and cross-domain alignment ($\hat{\rho}$ = 0.62) are highly correlated. This is confirmed by the overlapping confidence and credibility intervals. We were unable to find any studies that considered the operational–cross-domain alignment relationship, so we recommend future researchers specifically consider empirically examining these two alignment types together.

We found positive mean meta-analytic correlations/relationships between all of the alignment dimensions and performance types. The strongest and weakest corrected population correlation point estimates were associated with customer benefit (operational alignment $\hat{\rho}$ = 0.54 and intellectual alignment $\hat{\rho}$ = 0.27). Since the credibility intervals only overlap by 0.07 and the confidence intervals only overlap by 0.02, this suggests intellectual and operational alignment may have somewhat unique relationships with customer benefit. The cross-domain alignment–customer benefit corrected population correlation point estimates is $\hat{\rho}$ = 0.43. For productivity, all of the corrected population correlation point estimates are similar ($\hat{\rho}$ = 0.45, 0.44, 0.47 for intellectual, operational, and cross-domain alignment, respectively) with credibility and confidence intervals overlapping considerably. We also draw the reader's attention to the only negative value in the alignment–performance section between intellectual alignment and productivity in the lower credibility interval value (80% CV = -0.03, 0.93). For financial performance, only operational alignment seems to have a lower corrected population correlation point estimate ($\hat{\rho}$ = 0.36) than intellectual alignment ($\hat{\rho}$ = 0.42) and cross-domain alignment ($\hat{\rho}$ = 0.45); however, we note overlapping credibility and confidence intervals for all alignment dimensions.

We found positive mean relationships between all of the alignment dimensions and contextual variables. Our results also indicate that intellectual and operational alignment have different relationships with governance structure ($\hat{\rho}$ = 0.64 versus 0.28, respectively) and environmental turbulence ($\hat{\rho}$ = 0.35 versus 0.11, respectively). In each case, their credibility and confidence intervals do not overlap or only overlap by 0.06 (the confidence interval for governance structure). For these two constructs, the cross-domain alignment correlations fall in between the intellectual and operational alignment correlations ($\hat{\rho}$ = 0.57 and 0.12, respectively).

The relationship between cross-domain alignment and strategy is higher ($\hat{\rho}$ = 0.74) than strategy's relationship with intellectual ($\hat{\rho}$ = 0.44) or operational ($\hat{\rho}$ = 0.53) alignment, with an overlap in the upper credibility interval of only 0.02 and 0.01, respectively. Additionally, the relationship between cross-domain alignment and social alignment ($\hat{\rho}$ = 0.78) is higher than the intellectual and operational alignment correlations with social alignment ($\hat{\rho}$ = 0.65 and 0.70, respectively); however, we acknowledge the credibility and confidence intervals overlap considerably for all alignment dimensions and social alignment, possibly due to the low k-values. For IT investments, operational alignment has the lowest mean corrected population correlation point estimate ($\hat{\rho}$ = 0.12) versus intellectual alignment ($\hat{\rho}$ = 0.36) and cross-domain alignment ($\hat{\rho}$ = 0.34); however, we acknowledge the overlapping credibility and confidence intervals for all alignment dimensions. We also draw the reader's attention to the negative lower credibility and confidence values for cross-domain alignment–environmental turbulence and operational alignment–IT investments. Despite our thorough review and analysis of the literature, it is important to note that the collection of more data could change the findings for these relationships (i.e., the mean correlations/relationships could potentially be negative).

For the non-alignment relationships, all of the mean correlations/relationships were positive except between customer benefit and governance structure ($\hat{\rho}$ = -0.03). We also note the negative credibility and/or confidence intervals between IT investments and all of the variables besides strategy and between financial performance–governance structure, financial performance–environmental turbulence, and governance structure–strategy. Again, we note the low k-values for these relationships.

Methodological Moderator Analysis

The results presented in Table 4 indicate single respondent studies have higher corrected population correlation point estimates ($\hat{\rho}$) than matched pair studies for all relationships with $k \geq 2$. The magnitude of the differences varies considerably from 0.51 for the intellectual alignment–productivity relationship to 0.04 for the cross-domain alignment–customer benefit relationship.[10] The results also show the single respondent category was associated with the largest amount of variance attributed to artifacts (i.e., the highest PVA) compared to the unsplit group and the matched pair group for all but the intellectual alignment–financial performance and intellectual alignment–IT investments relationships.

[10]These significance tests and failsafe N tests were performed at the request of a reviewer.

Table 3. Meta-Analysis Results

		$\hat{\rho}$	k	N	Var.	SD_r	80% CV	95% CI[a]	PVA	Failsafe N[b]
Alignment Relationships										
Intellectual Alignment	Operational Alignment	0.7164	10	1728	0.0294	0.1641	0.50, 0.94	0.59, 0.84	22%	46
	Cross-Domain Alignment	0.6206	6	826	0.0206	0.1376	0.44, 0.80	0.49, 0.76	25%	25
Alignment–Performance Relationships										
Intellectual Alignment	Customer Benefit	0.2693	4	699	0.0273	0.1582	0.06, 0.48	0.09, 0.45	21%	9
Operational Alignment		0.5373	6	2094	0.0102	0.0936	0.41, 0.67	0.43, 0.64	38%	22
Cross-Domain Alignment		0.4300	4	819	0.0057	0.0903	0.33, 0.53	0.32, 0.54	53%	13
Intellectual Alignment	Productivity	0.4505	12	1581	0.1388	0.3138	-0.03, 0.93[c]	0.23, 0.67	7%	39
Operational Alignment		0.4354	7	989	0.0418	0.1684	0.17, 0.70	0.25, 0.62	31%	22
Cross-Domain Alignment		0.4718	6	1099	0.0284	0.1579	0.26, 0.69	0.32, 0.62	20%	20
Intellectual Alignment	Financial Performance	0.4192	24	3727	0.0493	0.2066	0.13, 0.70	0.32, 0.52	14%	74
Operational Alignment		0.3603	10	2608	0.0300	0.1550	0.14, 0.58	0.24, 0.48	19%	28
Cross-Domain Alignment		0.4486	13	2183	0.0374	0.1716	0.20, 0.70	0.33, 0.57	20%	42
Alignment–Context Relationships										
Intellectual Alignment	Governance Structure[d]	0.6426	12	1386	0.0001	0.1652	0.63, 0.65	0.50, 0.78	100%	51
Operational Alignment		0.2791	2	351	0.0345	0.2004	0.04, 0.52	0.00, 0.56	12%	5
Cross-Domain Alignment		0.5726	5	457	0.0000	0.3419	0.57, 0.57	0.18, 0.96	100%	19
Intellectual Alignment	Social Alignment	0.6509	30	4126	0.0520	0.2009	0.36, 0.94	0.56, 0.74	20%	128
Operational Alignment		0.6973	11	1834	0.0493	0.2002	0.41, 0.98	0.55, 0.84	19%	49
Cross-Domain Alignment		0.7827	7	1232	0.0270	0.1533	0.57, 0.99	0.61, 0.95	47%	34
Intellectual Alignment	Strategy[e]	0.4446	6	794	0.0621	0.2380	0.13, 0.76	0.23, 0.66	10%	19
Operational Alignment		0.5281	2	515	0.0296	0.1430	0.31, 0.75	0.26, 0.80	20%	7
Cross-Domain Alignment		0.7443	3	556	0.0000	0.0596	0.74, 0.74	0.66, 0.83	100%	14
Intellectual Alignment	Environmental Turbulence	0.3525	12	1665	0.0364	0.1722	0.11, 0.60	0.23, 0.48	24%	33
Operational Alignment		0.1054	2	209	0.0000	0.0234	0.11, 0.11	0.07, 0.15	100%	3*
Cross-Domain Alignment		0.1206	2	113	0.0095	0.1577	-0.004, 0.25	-0.13, 0.37	71%	3*

Table 3. Meta-Analysis Results (Continued)

		$\hat{\rho}$	k	N	Var.	SD_r	80% CV	95% CI	PVA	Failsafe N
Intellectual Alignment	IT Investments	0.3605	5	716	0.0767	0.2359	0.01, 0.72	0.10, 0.62	12%	14
Operational Alignment		0.1201	3	488	0.0223	0.1601	-0.07, 0.31	-0.08, 0.32	24%	5*
Cross-Domain Alignment		0.3433	3	277	0.0000	0.0338	0.34, 0.34	0.30, 0.39	100%	8
Non-Alignment Relationships										
Customer Benefit	Productivity	0.5244	5	990	0.1025	0.3140	0.11, 0.93	0.23, 0.81	3%	18
	Financial Performance	0.5123	9	2768	0.0645	0.2189	0.19, 0.84	0.34, 0.69	9%	32
	Governance Structure	-0.0340	1	238	0.0000	0.0000	-0.03, -0.03	-0.03, -0.03	100%	1*
	Social Alignment	0.4915	4	732	0.0028	0.0866	0.42, 0.56	0.39, 0.59	74%	14
	Strategy	0.5754	3	756	0.0135	0.1099	0.43, 0.74	0.42, 0.73	25%	12
	IT Investments	0.0096	3	702	0.0000	0.0536	0.01, 0.01	-0.06, 0.07	100%	3*
Productivity	Financial Performance	0.5533	7	1452	0.0105	0.1123	0.42, 0.68	0.45, 0.66	49%	26
	Governance Structure	0.2542	3	667	0.0309	0.1739	0.03, 0.48	0.04, 0.47	13%	7
	Social Alignment	0.5318	11	1711	0.0325	0.1605	0.30, 0.76	0.40, 0.66	30%	40
	Strategy	0.6948	3	665	0.0276	0.1611	0.48, 0.91	0.49, 0.90	13%	13
	Environmental Turbulence	0.4751	3	297	0.0795	0.2531	0.11, 0.84	0.13, 0.82	12%	10
	IT Investments	0.1132	4	666	0.0638	0.2502	-0.21, 0.46	-0.15, 0.38	10%	6*
Financial Performance	Governance Structure	0.2637	8	1308	0.0991	0.2772	-0.14, 0.67	0.03, 0.49	8%	19
	Social Alignment	0.4261	18	3044	0.0801	0.2421	0.06, 0.79	0.29, 0.57	11%	56
	Strategy	0.5624	6	1095	0.0189	0.1339	0.39, 0.74	0.43, 0.69	24%	23
	Environmental Turbulence	0.1370	9	1332	0.0213	0.1448	-0.05, 0.32	0.02, 0.25	32%	15*
	IT Investments	0.2716	6	1075	0.0624	0.2018	-0.05, 0.59	0.05, 0.49	13%	14

Table 3. Meta-Analysis Results (Continued)

		$\hat{\rho}$	k	N	Var.	SD_r	80% CV	95% CI	PVA	Failsafe N
Governance Structure	Social Alignment	0.4740	10	1403	0.0850	0.2212	0.10, 0.85	0.27, 0.67	17%	34
	Strategy	0.0451	4	353	0.0245	0.1499	-0.16, 0.25	-0.18, 0.27	51%	5*
	Environmental Turbulence	0.4312	6	622	0.0478	0.1618	0.15, 0.71	0.21, 0.65	35%	19
	IT Investments	0.2150	3	527	0.1168	0.2576	-0.22, 0.65	-0.19, 0.62	8%	6
Social Alignment	Strategy	0.6967	5	667	0.0155	0.1375	0.54, 0.86	0.54, 0.85	50%	22
	Environmental Turbulence	0.3228	8	1100	0.0189	0.1282	0.15, 0.50	0.19, 0.46	50%	21
	IT Investments	0.2390	5	719	0.1013	0.2385	-0.17, 0.65	-0.06, 0.54	13%	11
Strategy	Environmental Turbulence	0.3837	5	422	0.0000	0.0948	0.38, 0.38	0.27, 0.49	100%	15
	IT Investments	0.0530	1	160	0.0000	0.0000	0.05, 0.05	0.05, 0.05	100%	1*

$\hat{\rho}$ = corrected population correlation point estimate; k = number of studies; N = number of observations; Var. = variance of true score correlations; SD_r = sample size weighted observed standard deviation of correlations; 80% CV = lower and upper bounds of the 80% credibility value for $\hat{\rho}$; 95% CI = lower and upper bounds of the 95% confidence interval for $\hat{\rho}$; PVA = percent of variance in observed correlations attributable to sampling and measurement errors.

*When failsafe N is divided by k, ratios below 2.0 indicate publication bias is a potential problem (Sabherwal et al. 2006).

[a]95% CI = 1.96*([($\bar{\rho}$ / $\bar{r}$)SD_r]/ $\sqrt{k}$) (Daniel and Terrell 1995, p. 266; Hunter and Schmidt 2004, p. 207).

[b]A reviewer suggested we include this calculation to provide the readers with additional information. The formula is Failsafe $N = k*(\hat{\rho}+0.2)/0.2$ where 0.2 is a "small" corrected population correlation estimate increase (Long 2001). As noted in the formula, "failsafe N" refers to the k-value (i.e., the number of studies, not the number of subjects) needed to nullify an effect. This topic is discussed in Borenstein et al. (2009).

[c]Grey-highlighted cells = ranges that contain zero, suggesting the relationship may be negative or positive

[d]Only one study compared stable and turbulent environments (Tallon and Pinsonneault 2011). All other studies considered environmental turbulence as a continuous variable to increase their variability.

[e]Only one study reported unique correlations for the different strategies (Raymond and Bergeron 2008). All other studies considered strategy as a continuous variable to increase their variability.

Table 4. Moderator Meta-Analysis Results for Respondent Type

	$\hat{\rho}$	k	N	Var.	SD_r	80% CV	95% CI	PVA	Failsafe N
Intellectual Alignment – Productivity	0.4505	12	1581	0.1388	0.3138	-0.03, 0.93†	0.23, 0.67	7%	39
matched pairs	0.0601	3	383	0.2468	0.4069	-0.58, 0.70	-0.52, 0.64	5%	4*
single respondent	0.5703	9	1198	0.0430	0.1882	0.30, 0.84	0.42, 0.72	18%	35
t = 1.236, df = 1, p = 0.433									
Intellectual Alignment – Financial Performance	0.4192	24	3727	0.0493	0.2066	0.13, 0.70	0.32, 0.52	14%	74
matched pairs	0.2728	8	1373	0.0177	0.1405	0.10, 0.44	0.16, 0.38	28%	19
single respondent	0.5056	16	2354	0.0520	0.2089	0.21, 0.80	0.38, 0.63	14%	56
t = 3.344, df = 1, p = 0.185									
Intellectual Alignment – Social Alignment	0.6509	30	4126	0.0520	0.2009	0.36, 0.94	0.56, 0.74	20%	128
matched pairs	0.4513	9	1166	0.0615	0.2272	0.13, 0.77	0.28, 0.63	12%	29
single respondent	0.6860	21	2960	0.0336	0.1664	0.45, 0.92	0.60, 0.77	19%	93
t = 4.846, df = 1, p = 0.130									
Intellectual Alignment – Environmental Turbulence	0.3525	12	1665	0.0364	0.1722	0.11, 0.60	0.23, 0.48	24%	33
matched pairs	0.3099	5	937	0.0423	0.1928	0.05, 0.57	0.11, 0.50	13%	13
single respondent	0.3664	7	728	0.0185	0.1410	0.19, 0.54	0.23, 0.50	43%	20
t = 11.970, df = 1, p = 0.053									
Intellectual Alignment – IT Investments	0.3605	5	716	0.0767	0.2359	0.01, 0.72	0.10, 0.62	12%	14
matched pairs	0.0471	2	174	0.0000	0.0240	0.05, 0.05	0.01, 0.08	100%	2*
single respondent	0.4483	3	542	0.0648	0.2199	0.12, 0.77	0.14, 0.76	10%	10
t = 1.235, df = 1, p = 0.433									
Cross-Domain Alignment – Customer Benefit	0.4300	4	819	0.0057	0.0903	0.33, 0.53	0.32, 0.54	53%	13
matched pairs	0.3712	2	304	0.0157	0.1451	0.21, 0.53	0.17, 0.57	24%	6
single respondent	0.4134	2	515	0.0000	0.0074	0.41, 0.41	0.40, 0.43	100%	6
t = 18.592, df = 1, p = 0.034									

Table 4. Moderator Meta-Analysis Results for Respondent Type (Continued)

	$\hat{\rho}$	k	N	Var.	SD_r	80% CV	95% CI	PVA	Failsafe N
Cross-Domain Alignment – Productivity	0.4718	6	1099	0.0284	0.1579	0.26, 0.69	0.32, 0.62	20%	20
matched pairs	0.3212	2	304	0.0265	0.1723	0.11, 0.53	0.07, 0.57	18%	5
single respondent	0.5386	4	795	0.0214	0.1378	0.35, 0.73	0.37, 0.71	28%	15
t = 3.955, df = 1, p = 0.158									
Cross-Domain Alignment – Financial Performance‡	0.4486	13	2183	0.0374	0.1716	0.20, 0.70	0.33, 0.57	20%	42
matched pairs	0.2878	3	457	0.0575	0.1758	-0.02, 0.59	-0.02, 0.60	20%	7
single respondent	0.4736	9	1588	0.0234	0.1450	0.28, 0.67	0.36, 0.59	23%	30
t = 4.098, df = 1, p = 0.152									

$\hat{\rho}$ = corrected population correlation point estimate; k = number of studies; N = number of observations; Var. = variance of true score correlations; SD_r = sample size weighted observed standard deviation of correlations; 80% CV = lower and upper bounds of the 80% credibility value for $\hat{\rho}$; 95% CI = lower and upper bounds of the 95% confidence interval for $\hat{\rho}$; PVA = percent of variance in observed correlations attributable to sampling and measurement errors.

*When failsafe N is divided by k, ratios below 2.0 indicate publication bias is a potential problem (Sabherwal et al. 2006). These two relationships had ratios of 1.3 and 1.2, respectively; as such, publication bias may be a problem such that additional studies may change the point estimates and credibility/confidence intervals.

†Grey-highlighted cells = ranges that contain zero, suggesting the relationship may be negative or positive.

‡The sample size for the moderator analysis is different because one study could not be coded as either matched pair or single respondent (Luftman et al. 2008).

We found mixed results in the moderator analysis for the measure of alignment since single measure $\hat{\rho}$-values were higher than fit model $\hat{\rho}$-values in 8 out of 10 relationships whereas fit model $\hat{\rho}$-values were higher than single measure $\hat{\rho}$-values in 2 out of 10 relationships (see the intellectual alignment–productivity and cross-domain alignment–social alignment relationships in Table 5).

Discussion

Alignment is a general concept with multiple conceptualizations and definitions. We used Henderson and Venkatraman's (1999) SAM, with three alignment dimensions, to represent the subtle nuances of alignment found in the literature. In particular, alignment can refer to the fit between the business and IT strategic domains—*intellectual alignment* (e.g., Chen 2010), the fit between business and IT infrastructures and processes—*operational alignment* (e.g., Kang et al. 2008), or fit that transcends domains such that strategy is aligned with infrastructure—*cross-domain alignment* (e.g., Ling et al. 2009). Since many researchers use one of these definitions, yet do not clearly specify the dimension of alignment under examination, it can be difficult to consistently interpret the results across studies. To bring clarity to the alignment literature, we classified each study based on the alignment definition presented by its authors and then meta-analyzed the relationships between the constructs in alignment's nomological network.

The Alignment Paradox

Our broad objective was to understand whether alignment leads to firm performance. Our results provide evidence that the alignment—performance relationship is indeed positive across studies, which suggests there is *not much of an alignment paradox*. As such, our research shows that alignment appears to be important for various aspects of firm success

Table 5. Moderator Meta-Analysis Results for Measure of Alignment

	$\hat{\rho}$	k	N	Var.	SD_r	80% CV	95% CI	PVA	Failsafe N
Intellectual Alignment – Cross-Domain Alignment	0.6206	6	826	0.0206	0.1376	0.44, 0.80	0.49, 0.76	25%	25
fit model	0.5486	3	659	0.0042	0.0798	0.47, 0.63	0.44, 0.66	55%	11
single measure	0.9048	3	167	0.0000	0.0252	0.90, 0.90	0.87, 0.94	100%	17
t = 4.080, df = 1, p = 0.153									
Intellectual Alignment – Productivity	0.4505	12	1581	0.1388	0.3138	-0.03, 0.93†	0.23, 0.67	7%	39
fit model	0.5386	2	214	0.0000	0.0493	0.54, 0.54	0.46, 0.62	100%	7
single measure	0.4347	10	1367	0.1617	0.3343	-0.08, 0.95	0.17, 0.70	6%	32
t = 9.368, df = 1, p = 0.068									
Intellectual Alignment – Financial Performance	0.4192	24	3727	0.0493	0.2066	0.13, 0.70	0.32, 0.52	14%	74
fit model	0.2458	8	1491	0.0029	0.0869	0.18, 0.31	0.17, 0.32	74%	18
single measure	0.5367	16	2236	0.0446	0.1979	0.27, 0.81	0.42, 0.65	14%	59
t = 2.690, df = 1, p = 0.227									
Intellectual Alignment – Social Alignment	0.6509	30	4126	0.0520	0.2009	0.36, 0.94	0.56, 0.74	20%	128
fit model	0.4567	6	643	0.1129	0.2948	0.03, 0.89	0.17, 0.74	8%	20
single measure	0.6517	24	3483	0.0340	0.1680	0.42, 0.89	0.57, 0.73	18%	102
t = 5.684, df = 1, p = 0.111									
Intellectual Alignment – Environmental Turbulence	0.3525	12	1665	0.0364	0.1722	0.11, 0.60	0.23, 0.48	24%	33
fit model	0.3147	5	908	0.0418	0.1803	0.05, 0.58	0.12, 0.51	16%	13
single measure	0.3756	7	757	0.0250	0.1576	0.17, 0.58	0.23, 0.52	33%	20
t = 11.335, df = 1, p = 0.056									
Operational Alignment – Financial Performance	0.3603	10	2608	0.0300	0.1550	0.14, 0.58	0.24, 0.48	19%	28
fit model	0.3311	2	288	0.0000	0.0479	0.33, 0.33	0.26, 0.40	100%	5
single measure	0.3583	8	2320	0.0351	0.1629	0.12, 0.60	0.22, 0.50	16%	22
t = 25.346, df = 1, p = 0.025									

Table 5. Moderator Meta-Analysis Results for Measure of Alignment (Continued)

	$\hat{\rho}$	k	N	Var.	SD_r	80% CV	95% CI	PVA	Failsafe N
Cross-Domain Alignment – Customer Benefit	0.4300	4	819	0.0057	0.0903	0.33, 0.53	0.32, 0.54	53%	13
fit model	0.3712	2	304	0.0157	0.1451	0.21, 0.53	0.17, 0.57	24%	6
single measure	0.4134	2	515	0.0000	0.0074	0.41, 0.41	0.40, 0.43	100%	6
t = 18.592, df = 1, p = 0.034									
Cross-Domain Alignment - Productivity	0.4718	6	1099	0.0284	0.1579	0.26, 0.69	0.32, 0.62	20%	20
fit model	0.3698	4	483	0.0398	0.1839	0.11, 0.63	0.15, 0.59	21%	11
single measure	0.6312	2	616	0.0078	0.0796	0.52, 0.74	0.48, 0.78	32%	8
t = 3.829, df = 1, p = 0.163									
Cross-Domain Alignment – Financial Performance	0.4486	13	2183	0.0374	0.1716	0.20, 0.70	0.33, 0.57	20%	42
fit model	0.4382	7	992	0.0439	0.1797	0.17, 0.71	0.26, 0.62	21%	22
single measure	0.4615	6	1191	0.0326	0.1620	0.23, 0.69	0.30, 0.62	18%	20
t = 38.614, df = 1, p = 0.016									
Cross-Domain Alignment - Social Alignment	0.7827	7	1232	0.0270	0.1533	0.57, 0.99	0.61, 0.95	47%	34
fit model	0.8728	2	145	0.0088	0.1013	0.75, 0.99	0.69, 1.06	49%	11
single measure	0.6874	5	1087	0.0301	0.1490	0.47, 0.91	0.51, 0.87	25%	22
t = 8.415, df = 1, p = 0.075									

$\hat{\rho}$ = corrected population correlation point estimate; k = number of studies; N = number of observations; Var. = variance of true score correlations; SD_r = sample size weighted observed standard deviation of correlations; 80% CV = lower and upper bounds of the 80% credibility value for $\hat{\rho}$; 95% CI = lower and upper bounds of the 95% confidence interval for $\hat{\rho}$; PVA = percent of variance in observed correlations attributable to sampling and measurement errors.

[†]Grey-highlighted cells = ranges that contain zero, suggesting the relationship may be negative or positive.

and that academics' investment in predicting and understanding alignment's implications is well placed. Only the intellectual alignment–productivity relationship suggests an alignment paradox might exist in some situations. We propose the possibility of a negative relationship may not be surprising since intellectual alignment is strategic whereas productivity is more closely associated with operational activities. In other words, some companies may be willing to "sacrifice" some productivity to achieve a top-notch strategy (e.g., Zappos offers free shipping both ways and a 365 day return policy, which may not necessarily be "productive" in regard to cost but undoubtedly matches their customer-first strategy[11]). We encourage future researchers to pursue this theoretical justification to explain why this particular alignment–performance relationship may be negative. If this relationship is indeed negative in some situations, we also encourage future researchers to assess *which intellectual alignment situations result in lower productivity levels* so practitioners can consider and potentially protect against this phenomenon.

[11]http://www.zappos.com/shipping-and-returns.

Our results indicate unique alignment–performance relationships in three cases. First, intellectual alignment has a weaker relationship with customer benefit than operational alignment while cross-domain alignment takes the middle ground. This may be because operational alignment allows companies to reduce their costs, which can then be passed on to the customer (i.e., lower price equals a happy consumer). While cross-domain alignment may be able to achieve some of the same cost benefits due to the alignment with infrastructures and processes (hence, the similarity to operational alignment), aligning only strategies (intellectual alignment) may not give companies the same benefit because they are focused on higher-level activities.

Second, customer benefit has a stronger relationship with operational alignment than financial performance while productivity falls somewhere in between. Based on our previous argument, the similarity between customer benefit and productivity makes sense in that productivity may be a mediator between the operational alignment–customer benefit relationship where operational alignment leads to greater productivity which, in turn, leads to higher levels of customer benefit. This logic may also explain the operational alignment–financial performance relationship being weaker in that companies may be choosing to pass all of the cost savings to the customer instead of improving their bottom line.

Third, operational alignment has a somewhat weaker relationship with financial performance compared to intellectual and cross-domain alignment. Assuming the logic above is correct, a future question may be why would the alignment of infrastructures and processes be less profitable or less competitively advantageous than aligning strategies? This seems to assume all strategies are profit-oriented, which isn't always the case (e.g., Zappos has a customer-first strategy). Also, if operational alignment does lead to greater productivity than the other types of alignment, why wouldn't productivity result in higher levels of financial performance? This seems to assume all companies that become productive will pass the savings on to their customers, so what if they don't do that?

While we have included some potential theoretical reasons for these three unique findings between alignment and performance, we recommend scholars pursue developing a *strong theoretical foundation* for explaining our results (for additional information, see Bharadwaj et al. 2013; for some theoretical arguments, see Wang et al. 2012).

Other Contextual Variables in Alignment's Nomological Network

We found evidence that intellectual and operational alignment have different point estimates when correlated with governance structure and environmental turbulence while cross-domain alignment falls in the middle. We propose both variables may potentially act as antecedents of the three alignment types. For example, does a centralized governance structure make it easier for companies to achieve intellectual and cross-domain alignment because the executive team makes all the decisions? Does environmental turbulence "force" the executive team to get together more frequently to address market uncertainty such that they have to be more strategically aligned? We encourage future researchers to explore these questions or other theoretical reasons behind why intellectual alignment has stronger relationships with governance structure and environmental turbulence compared to operational alignment and why cross-domain alignment is not different from the other two alignment types (for initial theoretical development, see Guillemette and Pare 2012; Tallon et al. 2013; Wang et al. 2012).

The relationship between cross-domain alignment and social alignment is higher than the intellectual and operational alignment correlations with social alignment. Since the relationships overlap considerably across studies, we recommend researchers conduct future studies that further develop theoretical explanations for why, and which, conditions lead to variance in the alignment–social alignment relationship (see Dulipovici and Robey (2013), using social representation theory). For example, is social alignment more critical for cross-domain alignment because the strategic-level business and IT people need to coordinate with the operational-level business and IT people? Is social alignment less critical at the strategic level because it is a smaller group of people who naturally see eye-to-eye?

The relationship between cross-domain alignment and strategy is higher than strategy's relationship with intellectual and operational alignment. We could find no explanation for why the intellectual alignment–strategy relationship is the weakest. Since it seems the strategy-level alignment would have the strongest relationship with strategy, future researchers should develop and test explanations that probe if and why intellectual alignment has a weaker relationship with strategy than operational alignment (for initial theoretical development, seeYayla and Hu 2012). Some questions we propose for future researchers are

- Does cross-domain alignment require a solid strategy to ensure the alignment of strategies and infrastructures/processes can occur?
- Is agreeing on a particular strategy less critical for operational alignment since it only impacts infrastructures and processes?
- Is the alignment of strategies (intellectual alignment) independent of the strategy itself?

For IT investments, we found the operational alignment–IT investments relationship was the weakest and could potentially be negative in some situations. We found very few studies empirically evaluated this relationship, so we recommend future researchers specifically consider this relationship and identify the circumstances under which this relationship may be negative (for theoretical arguments on IT investments and alignment, see Mithas et al. 2013).

Methodological Moderators

We argued respondent type would bias the results such that single respondent types would result in larger estimates compared to matched pair respondent types. Our results supported this argument for all tested relationships. For two relationships (i.e., intellectual alignment–productivity and cross-domain alignment–financial performance), matched pairs resulted in negative lower values for the credibility and confidence intervals. This suggests matched pairs may explain why some studies have found an alignment paradox, particularly for intellectual alignment–productivity or cross-domain alignment–financial performance studies. This may be due to disagreement between IT and business executives on the role and success of IT where business executives often under- or over-estimate IT capabilities (Preston and Karahanna 2009). Taken together, our results indicate researchers should *use single respondents with caution* as they may upwardly bias the results (by substantial margins in some cases). While scholars have acknowledged the use of single respondents was a limitation of their research (e.g., Armstrong and Sambamurthy 1999; Lai et al. 2009; Tallon et al. 2000), this is the first study to illustrate the magnitude of the impact of using single respondents in the alignment literature.

We also argued the alignment measure would bias the results such that single measures would result in larger estimates compared to fit model measures. In support of this argument, we found that in most cases calculating (i.e., fit model) alignment resulted in a more conservative estimate than directly questioning firms on their perceptions of alignment (i.e., single measure). These results suggest subjectivity and measurement error may be problems when using single measures; as such, future research is necessary to *revisit how we measure dimensions of alignment*.

Even with the inclusion of these two methodological moderators, our results indicate there is still a fair amount of variance left for most of our relationships. On the one hand, respondent type explained 100 percent of the variance only for intellectual alignment–IT investments and cross-domain alignment–customer benefit with most PVAs well below 50 percent. On the other hand, the measure of alignment explained 100 percent of the variance for 5 of the 12 relationships we evaluated (intellectual alignment with cross-domain alignment and productivity, operational alignment with financial performance and cross-domain alignment with customer benefit and governance structure); however, the other seven relationships had less than 50 percent variance accounted for less the intellectual alignment-financial performance relationship (PVA for fit models = 74%). Given the unexplained variance for most of our relationships, we suggest future researchers *consider additional moderators to further explain the variance among studies*. This includes, but is not limited to, moderators within alignment's nomological network; for example, are IT investments and environmental turbulence moderators rather than antecedents of alignment or are they mediators between alignment and performance?

Implications for future research are shown in Table 6.

Limitations

Like all studies, our work is not without limitations. Specifically, we found relatively few studies examined the operational (k = 20) and cross-domain (k = 18) dimensions of alignment. When we further analyzed their relationships with the three firm performance types, this frequently resulted in k-values below 10, which can create a greater sense of uncertainty in interpreting our conclusions (Switzer et al. 1992). An *ex ante* power analysis and failsafe N[12] calculation indicated we had a sufficient number of studies to avoid publication bias in most cases. Nevertheless, for relationships with k-values below 4, we acknowledge that we cannot be sure

[12]We thank the anonymous review panel for making these suggestions. More details on low k-value interpretation can be found in the following sources: Borenstein et al. (2009), Hedges and Pigott (2001), and Hedges and Pigott (2004).

Table 6. Implications for Future Research

Relationship	Finding	Implication(s) and Theoretical Considerations
Alignment–Performance Relationships		
Alignment–Performance	Positive across studies	There is not much of an alignment paradox and alignment likely leads to firm performance.
Intellectual Alignment–Productivity	Positive across studies but slightly negative $\hat{\rho}$-values possible in some studies	Research is needed to determine if and when this relationship is negative. Potential Rationale: Since intellectual alignment is strategic while productivity is operational, it may be that some companies are willing to sacrifice productivity depending on their strategic orientation.
Alignment–Customer Benefit	Operational alignment has a stronger relationship than intellectual alignment; cross-domain alignment is in the middle	Aligning infrastructures and processes benefits customers more than aligning strategies. Potential Rationale: Operational alignment allows for greater efficiency within the organization, which leads to lower costs that can be passed onto the customer.
Operational Alignment–Performance	Customer benefit has a stronger relationship than financial performance; productivity is in the middle	Aligning infrastructures and processes benefits customers more than it benefits companies. Potential Rationale: The operational alignment-customer benefit relationship may be mediated by productivity. Companies may be choosing to pass all the savings to the customers to achieve longer-term financial performance.
Alignment–Financial Performance	Operational alignment has a slightly weaker relationship than the other two alignment types	Aligning strategies opposed to infrastructures and processes is more closely linked to higher levels of financial performance. Potential Rationale: Strategies may be profit-oriented while infrastructures and processes are not.
Alignment–Context Relationships		
Alignment–Governance Structure	Intellectual alignment has a stronger relationship than operational alignment; cross-domain alignment is in the middle	Centralized governance structures are more closely related to aligned strategies than aligned infrastructures and processes. Potential Rationale: Centralized governance structures may facilitate executive team alignment because that team needs to show a united front to the rest of the company.
Alignment–Environmental Turbulence	Intellectual alignment has a stronger relationship than operational alignment; cross-domain alignment is in the middle	Environmental turbulence is more closely related to aligned strategies than aligned infrastructures and processes. Potential Rationale: Uncertain markets may require executive teams to meet more frequently and align their strategies more closely to quickly react to changes in the environment.
Alignment–Social Alignment	Similar results across studies	Research is needed to explore the conditions under which the alignment-social alignment relationship will vary. Potential Rationale: The cross-domain alignment-social alignment relationship may be stronger because coordination across these departments is critical to success, or intellectual alignment-social alignment may be stronger because smaller groups of like-minded people are working together.
Alignment–Strategy	Cross-domain alignment has a stronger relationship than the other two alignment types	Strategy is most closely related to cross-domain alignment. Potential Rationale: A solid strategy may be necessary to achieve the alignment across strategies and infrastructures/processes while it is not a requirement for within-domain alignment.
Alignment–IT Investments	Operational alignment has a weaker relationship than the other two alignment types	These relationships have been under-studied, so we recommend future researchers empirically examine these relationships with particular attention on determining if and why operational alignment has the weakest, if not a negative, relationship.

Table 6. Implications for Future Research (Continued)

Relationship	Finding	Implication(s) and Theoretical Considerations
Methodological Moderators		
Respondent Types	Single respondent studies frequently result in higher corrected population correlation estimates than matched pair studies	Researchers should use single respondents with caution.
Measures of Alignment	Fit model studies may result in more conservative estimates of alignment than single measures of alignment when studying most relationships in alignment's nomological network	Subjectivity and measurement error may be problematic for single measures, but fit models aren't always the most conservative method. Researchers need to revisit how to measure the alignment dimensions effectively.

these few studies actually represent stable estimates of the population as a whole and that the corrected population correlation point estimate resulting from the meta-analysis may, in fact, be higher or lower than our results indicate. Nonetheless, our k is consistent with other firm-level meta-analyses that report similarly small k-values when splitting their data into subcategories (e.g., Lee and Xia 2006; Stahl and Voigt 2008).

Conclusion

Analyzing 30 years of alignment research, we examined whether IT–business strategic alignment leads to higher firm performance. We found the bulk of the extant evidence suggests there is not much of an alignment paradox, which suggests alignment should lead to higher levels of performance. We also found the contextual variables frequently considered in alignment's nomological network are correlated with alignment, often in unique ways. Regarding the moderator analyses, single respondents and single measures moderate the association between alignment and its nomological network, where both may upwardly bias the results. We hope this consolidation and framing can provide more specific guidance for future theoretical work that allows researchers to more efficiently work toward the goal of understanding the alignment–performance relationship.

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Appendix

Studies Included in the Meta-Analysis

Legend: Alignment Dimension: I (Intellectual); O (Operational); C (Cross-Domain)
Performance Type: F (Financial Performance); P (Productivity); C (Customer Benefit)

Study (Source)	Alignment Term(s)	Alignment Dimension			Performance Type			Sample Size(s)
		I	O	C	F	P	C	
Armstrong and Sambamurthy 1999	assimilation			X	X			153
Barua et al. 2004	process alignment, system integration		X		X		X	1076
Bergeron et al. 2001	fit	X		X	X			110
Bharadwaj et al. 2007	coordination; integration		X			X		169
Byrd et al. 2006	strategic alignment, coordination, integration	X			X			84
Cataldo et al. 2012	strategic alignment	X						38
Celuch et al. 2007	strategic alignment		X		X		X	160
Chan et al. 2006	strategic alignment	X			X			226, 244
Chatzoglou et al. 2011	alignment			X	X			295
Chen and Tsou 2007	strategic alignment	X		X	X			124
Chen 2010	alignment	X						22
Chung et al. 2003	strategic alignment, strategic IT-business alignment	X						191
Cragg et al. 2002	alignment	X			X		X	256
Croteau and Raymond 2004	co-alignment, IT competencies	X		X	X			104
Fink and Neumann 2009	strategic alignment, IT compatibility, IT connectivity, IT modularity	X	X		X			293
Gottschalk and Solli-Saether 2001	integration, performance criteria for IS function, role of IS function	X		X				41
Heim and Peng 2010	process integration intelligence		X		X	X	X	238
Hong and Kim 2002	organizational fit		X			X		34
Hooper et al. 2010	alignment		X		X		X	175
Huang 2009	alignment of IS with business strategy	X						209
Huang 2012	IS plan, posterior-strategic alignment	X						109
Hung et al. 2010	strategic alignment, IT alignment, structural alignment	X	X	X	X	X	X	355
Kang et al. 2008	ERP alignment		X			X		116
Kanooni 2009	strategic information systems planning alignment; task coordination	X				X		126
Kearns 2006	planning alignment	X			X			20, 141
Kearns and Lederer 2000	planning alignment	X			X			268

Study (Source)	Alignment Term(s)	Alignment Dimension			Performance Type			Sample Size(s)
		I	O	C	F	P	C	
Kearns and Lederer 2003	strategic alignment	X			X			161
Kearns and Lederer 2004	planning alignment	X			X			161
Kearns and Sabherwal 2006	strategic alignment	X			X	X		273
Kempaiah 2008	strategic alignment maturity	X			X			15
Khadem 2007	strategic alignment; strategic fit; strategic integration	X						321
Kunnathur and Shi 2001	alignment	X			X		X	90
Lai et al. 2009	strategic alignment	X				X		166
Lee et al. 2004	alignment	X				X		57
Lee et al. 2008	technical alignment		X		X	X		12
Li et al. 2006	goal, objectives, planning process alignment	X				X	X	49
Ling et al. 2009	alignment, organizational alignment capability			X	X	X		72
Luftman et al. 2008	strategic alignment maturity			X	X			138
Masa'deh and Shannak 2012	innovation lever, productivity lever	X		X	X		X	160
Masa'deh et al. 2010	structure and process, strategic alignment	X		X	X			180
Morris 2006	strategic integration	X						102
Nash 2006	strategic alignment maturity	X			X	X		9
Newkirk and Lederer 2006a	alignment, analysis	X	X					161
Newkirk and Lederer 2006b	alignment, analysis	X	X					161
Newkirk et al. 2008	alignment	X						161
Powell 1992	structural integration		X		X			113
Preston and Karahanna 2009	strategic alignment	X						243
Raymond and Bergeron 2008	strategic alignment			X	X	X	X	107
Rhodes et al. 2011	strategic alignment			X	X	X		261
Rigoni et al. 2010	commitment	X						72
Rivard et al. 2006	alignment, strategic fit, IT supports strategy, IT supports firm assets	X	X		X			96
Saaksjarvi 2000	integration, alignment			X				33, 91
Sabegh and Motlagh 2012	business-IT alignment	X			X			136
Sabherwal and Chan 2001	strategic alignment	X			X			62, 164, 226
Sanchez Ortiz 2003	alignment			X				1
Schwarz et al. 2010	alignment	X				X		58
Segars and Grover 1998	alignment, analysis	X	X					253
Stoel 2006	alignment	X			X	X		69
Taipala 2008	strategic alignment	X			X			72, 76
Tallon 2000	strategic alignment			X	X	X	X	63
Tallon 2007	alignment			X	X	X	X	241
Tallon et al. 2000	strategic alignment	X			X	X	X	304
Tallon and Pinsonneault 2011	alignment	X			X			241
Tan and Gallupe 2006	alignment	X						6
Teo and King 1996	integration	X				X		157
Teo and King 1997	integration	X						157
Teo and King 1999	integration	X				X		157
Tiwana and Konsynski 2010	alignment, IT agility	X	X					90
Wang and Tai 2003	integration	X				X		156
Yayla 2008	alignment	X						33, 169
Zhu et al. 2009	fit		X			X		65