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Identification of IT-Business Strategic Alignment Maturity Factors: An Exploratory Study

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ABSTRACT

Achieving IT-business alignment has been a long-standing critical information management objective. The findings of this exploratory research further extend strategic alignment research and provide a deeper understanding of the process of IT-business strategic alignment. A theoretical model of the maturity levels of the management practices and strategic IT choices that enable alignment was empirically tested. A survey was conducted of 116 IT and business executives from ten business units across seven organizations. Confirmatory factor analysis validated six factors of maturity (Communications, Competency and Value Measurement, Governance, Partnership, Scope and Architecture, and Skills) and identified 23 criteria to measure the maturity of strategic alignment. A mixed model repeated measures ANOVA obtained significant results for both the main effect and interaction effect of differences for the six maturity factors across the ten business units. These findings suggest that the assessment instrument can be used by organizations to improve their alignment levels.

Keywords

Alignment of IT plans with business plans, IT strategic planning

INTRODUCTION

IT and business leaders are continually looking to align their IT and business strategies. In their latest annual survey, Computer Sciences Corporation reported that IT-business strategic alignment has persisted among the top-ranked concerns of IT executives since the survey's inception in 1987 (CSC, 2001). In a more recent study over 300 Society for Information Management (SIM) executives ranked IT-Business alignment as their number one management concern (Beal, 2003). Clearly there is a need and benefit to aligning the IT and business functions.

The degree of alignment among IT and business is facilitated by a complex interaction of management practices and strategic IT choices which an organization makes. This study proposes that there are different degrees of this interaction, referred to as maturity, and that an organization's maturity level corresponds with the alignment level between IT and business. Both the dynamic nature and the process of alignment reflect key organizational practices which enable alignment or inhibit it in their absence or misapplication (Luftman, 2000). Luftman (2000) proposed a model of alignment that exhibits these concepts. The Strategic Alignment Maturity (SAM) model involves the following five conceptual levels of strategic alignment maturity:

1. Initial/Ad Hoc Process: Business and IT not aligned or harmonized
2. Committed Process: The organization has committed to becoming aligned
3. Established Focused Process: Strategic Alignment Maturity established and focused on business objectives

4. Improved/Managed Process: Reinforcing the concept of IT as a “Value Center”
5. Optimized Process: Integrated and co-adaptive business and IT strategic planning

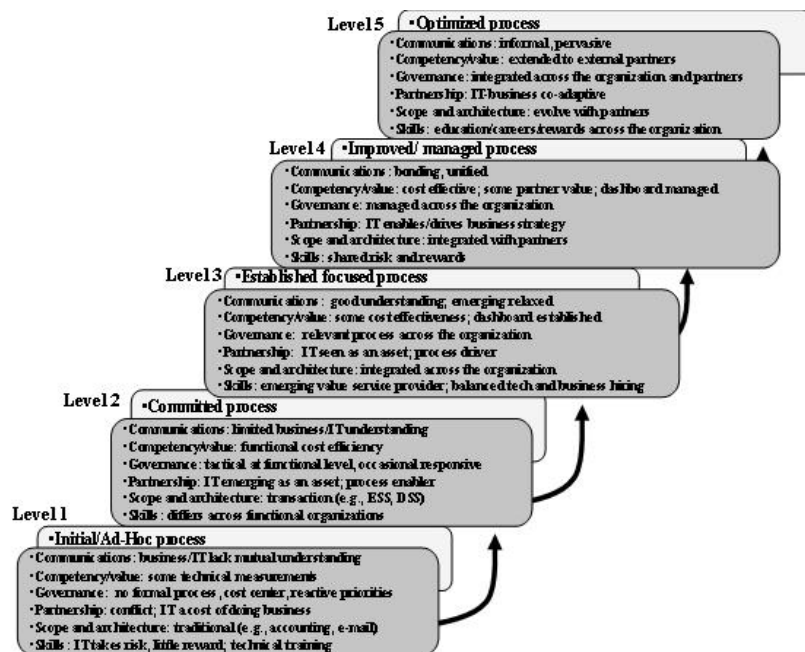
Each of the five levels of alignment maturity focuses on a set of six criteria, (1) Communication, (2) Competency/Value Measurement, (3) Governance, (4) Partnership, (5) Scope and Architecture, and (6) Skills, pertaining to possible management practices and strategic IT decisions within an organization, each of which has the potential to facilitate strategic alignment between the IT and business functions (see Figure 1). More mature alignment includes the pervasiveness of these practices throughout the firm and with the external environment via business partners and alliances.

A premise of this study, which helps explain how and why organizations move from one Strategic Alignment Maturity level to the next, is that organizational development and change occurs as a result of both planned and unplanned management practices and strategic IT choices which are influenced by both the internal and external environment of the organization. One possible impetus of change, explained by the punctuated equilibrium perspective, is that incremental change by competitive selection of organizational routines initiated by the “purposeful enactment” (Van de Ven & Poole, 1995) of top management and the ensuing discontinuity, results in the transcending of the organization from one maturity level to another.

Another possible impetus of change, explained by the evolution and teleological perspectives, is that deliberate and planned implementation of management practices and strategic IT choices enable an organization to adapt to its internal and external environment so that it remains competitive.

Additionally, institutional and diffusion theory suggest that the diffusion of management practices evolves from an ad-hoc adoption to becoming interorganizationally ingrained based on an organization’s need to conform to the requirements or expectations of its institutional partners, alliances, and competitors (Zeitz, Mittal, & McAulay, 1999).

To this end, an additional premise of this study is that Strategic Alignment Maturity can be influenced by identifiable organizational initiatives (for example by conducting an assessment of maturity practices and making specific management decisions to implement specific management practices and strategic IT choices) which encourage (or discourage) implementation and ongoing use of the processes and mechanisms associated with strategic alignment and that organizations can make deliberate efforts to implement these management practices and strategic IT choices, resulting in deliberate organization-led increased Strategic Alignment Maturity.



Source: Luftman, J., *Addressing Business-IT Alignment Maturity*; Communications of the Association for Information Systems, December 2000

Figure 1. Strategic Alignment Maturity Summary

DEVELOPMENT OF THE SAM CONSTRUCT

Communication Maturity refers to the effectiveness of leveraging information for mutual understanding and knowledge sharing. Communication has long been associated with IT-business alignment. Calhoun and Lederer (1990) found that a lack of communication of top management's objectives could account for the business function's dissatisfaction with strategic information systems planning. Empirical support for the connection between communication frequency and convergence in understanding was reported in Lind and Zmud (1991). Reich and Benbasat (2000) found that shared domain knowledge and communication between IT and business managers positively influence alignment. Rockart, Earl, and Ross (1996) suggested that communication ensures that business and IT capabilities are integrated into the business effectively. Luftman, Papp, and Brier (1999) reported that IT understanding the business was one of the top three enablers of alignment.

Competency/Value Measurement Maturity refers to the management decisions and strategic choices an organization makes when determining the value and contribution of IT to the firm. This includes management practices in IT assessments and reviews, performance management metrics, and continuous improvement applied to facilitate IT-business alignment. Henderson, Venkatraman, and Oldach (1996) suggest that value management is a valuable mechanism for ensuring that maximum benefits are achieved from IT investments, and as such, are a means to facilitate IT-business alignment. Papp (1999) suggests that, "alignment enables a firm to maximize its IT investments and achieve harmony with its business strategies and plans, leading to greater profitability." Van Der Zee & Jong (1999) suggest that a balanced scorecard can be a valuable contributor to alignment. Evaluation of IT investments, including formal and regular reviews, is positively related to IT-business alignment (Tallon, Kraemer, & Gurbaxani; 2000).

Governance Maturity refers to the choices organizations make when allocating decision rights for IT activities such as prioritizing projects and controlling budgets and IT investments (Henderson et al., 1996). Henderson et al. (1996) suggest that governance is a valuable mechanism to facilitate IT-business alignment. They see governance as a mechanism for specifying IT decision-making capabilities within the organization and with strategic alliances and partners. Luftman et al. (1999) identified well prioritized IT projects as a top enabler of strategic alignment.

Partnership Maturity pertains to how IT and the business perceive the contribution of each other. Sharing risk and responsibility of IT initiatives requires trust and mutual respect between IT and business partners (Ross, Beath, & Goodhue, 1996). Effective long-term partnerships are sustained when IT and business partners exhibit trust and positive attitudes toward the potential contributions of each other (Henderson, 1990).

Scope and Architecture Maturity refers to the management decisions and strategic choices an organization makes when allocating resources toward its information technology infrastructure, including its reach and range. Keen (1996, p. 152) suggests that IT architecture, integration, infrastructure, and standards should be defined from the organization's goals and that IT infrastructure should be an early consideration when defining business goals. IT standards facilitate connection and integration among technology components allowing easier information access across business units (Weill & Broadbent, 1998, p. 58) and enable organizations to more easily share information with their business partners (Edwards, Peters, & Sharman, 2001).

Skills Maturity refers to the ability to attract and retain staff knowledgeable in IT and business as well as the organization's cultural climate toward change and innovation. IT professionals with knowledge and skills in technology, business operations, management, and interpersonal skills are more valuable to an organization than those with only technical skills (Rockart et al., 1996; Ross et al., 1996). Strategic alignment is a process of continuous adaptation and change (Henderson & Venkatraman, 1993). The adoption and diffusion of IT throughout an organization is better enabled when an organization anticipates change. Being ready for change may increase the potential for change efforts to be more effective (Armenakis, Harris, & Mossholder, 1993).

METHOD

Instrument Development

To provide a representation of each organization's strategic alignment maturity level at the time of the study, a cross-sectional design was employed utilizing a survey assessment instrument. Since this study is the first to empirically test a measure of Strategic Alignment Maturity, it was necessary to develop an instrument to test the research questions. The instrument consisted of 39 items using a 5-point multiple-choice scale. Each assessment item consisted of multiple choice questions. Each choice represented a different level of maturity, with a score of 1 indicating the lowest level of maturity and a

score of 5 indicating the highest level of maturity. The concept behind each statement and its answer was drawn from the existing literature wherever possible. A pre-test and pilot test of the survey was conducted.

Data Collection

A survey was conducted of 116 IT and business executives from ten business units across seven organizations. The respondents completed the assessment instrument as part of a strategic alignment assessment consultation which their organizations enrolled during 2002. The assessment program was offered to all organizations who were current members of The Conference Board or SIM. The seven organizations participating in this study include one government agency, two chemical manufacturers, and four firms within the financial and insurance industry. Each organization is located in the New Jersey-New York geographic region and has a national and international presence, as well. The number of employees ranged from approximately 1,000 employees to over 50,000 employees. For the five publicly held companies, total revenue ranged from \$300 million to \$5.5 billion. The organizational functional level of respondents included 63 who were self-identified as belonging to a business function, and 53 self-identified as belonging to an IT function. The title of responding executives ranged from "Staff" to "CEO", with the majority being either "VP" or "Director".

ANALYSIS AND RESULTS

The means for the 39 survey questions ranged from 2.20 to 3.80 and the standard deviations ranged from 0.84 to 1.35. In general, the data showed positive and significant correlations between items, with only 70 of the 780 intercorrelations not significant. Two correlations were negative but neither was significant. The significant correlations ranged from .18 to .60 with the majority of them having a moderate correlation between the range of .21 and .40. This suggested many of the items may be useable in an exploratory factor analysis (Tabachnick & Fidell, 1996).

Factor Analysis of Maturity Criteria

To address the first research question, "What are the factors that comprise the Strategic Alignment Maturity construct?", the initial model using the six *a priori* components of the Strategic Alignment Maturity model was tested using confirmatory factor analysis to see if there was a good fit with the data set from the 116 respondents. Tabachnick and Fidell (1996 p. 640) recommend at least 300 cases for statistical power in studies utilizing factor analysis. Another heuristic suggests a minimum of 150 cases for exploratory factor analysis (Hinkin, 1995). In this study, however, neither of these sample size requirements was met. Since a major objective of this study was to develop an instrument to measure strategic alignment maturity, it was decided that 116 cases was sufficient for purposes of refining the questionnaire items for subsequent research. The factor analysis could not be used to refine the design or wording of the initial questionnaire, which had already been used to collect the data for this study. But, rather the factor analysis could be used to delete items from the initial research construct in order to reduce the number of items and the number of emergent factors, which may then increase the reliability of the construct for future analysis.

The LISREL statistical package version 8.51 was applied to the covariance matrix with the model estimated using maximum likelihood. Due to the existence of multivariate kurtosis and skewness, the robust maximum likelihood estimation feature of LISREL was used. According to Ferrando and Lorenzo (2000), normal-based procedures, such as the usual maximum likelihood technique, with non-normal data, may lead to distorted results. The robust ML uses the ML estimates obtained under the normality assumption, but the chi-square is corrected for non-normality using the Santorra-Bentler scaled chi-square statistic and standard errors are adjusted, with the end result being a more appropriate test (Ferrando & Lorenzo, 2000). The proposed *a priori* model, comprised of the six Strategic Alignment Maturity components, resulted in a lack-of-fit for the collected data ($\chi^2(687) = 1024.051$ ($p = .00$), RMSEA = 0.0524, GFI = .713, AGFI = 0.674, CFI = 0.815, and PGFI = .628).

Due to the lack of fit with the original model, exploratory factor analysis was then performed. The SPSS version 10.0 principal component factor analysis with varimax rotation was used on the 39 maturity items with a six-factor extraction requested. Items were dropped from further analysis if their factor loadings were less than 0.40 or if they had loadings greater than 0.40 on two or more retained factors. As a result, 12 items were dropped, with 27 items remaining in the solution. Each factor had acceptable reliability with an alpha coefficient greater than 0.70 using Cronbach's reliability test with the exception of the sixth factor. Due to the weak alpha coefficient (Cronbach's alpha = 0.623), it was decided to drop the sixth factor from the follow-up confirmatory factor analyses. The total variance explained by the five-factor solution was 63.37%. The follow-up confirmatory factor analysis used this five-factor model as a baseline instead of the *a priori* model for Strategic Alignment Maturity.

The follow-up confirmatory factor analysis, using as input the five factors defined in the EFA, resulted in good fit for the RMSEA and CFI indices but the other indicators were below the goodness-of-fit thresholds ($\chi^2(314) = 395.292$ ($p = .00124$), RMSEA = 0.0314, GFI = .816, AGFI = 0.779, CFI = 0.934, and PGFI = 0.678). This model, while meeting the minimum requirements for empirical goodness-of-fit, did not fit theoretically. An alternative model was proposed which consisted of variables from the second model but with theoretically illogical items removed and with items having large (outside of +/- 2.00) standardized residuals removed. A high residual suggests that an item is not converging with other items in explaining the latent sources of variation (Segars & Grover, 1998). Following CFA analysis suggestions by Segars and Grover (1998), each of these items was discarded one by one and the model was reevaluated. Additionally, in support of the primary objective of this study to validate the Strategic Alignment Maturity model, the Communication items from the *a priori* model, which were mostly eliminated from the second model, were included in the final model. Initially, all six of the Communication items were included in the final model. But, with COMM_6 in the model, the modification indices for the COMM_6 to COMP and COMM_6 to SKILLS paths were greater than 5.0 and the χ^2 was significant, so COMM_6 was dropped, resulting in a goodness-of-fit with all indicators above the threshold except for GFI ($\chi^2(215) = 221.113$ ($p = .373$), RMSEA = 0.000, GFI = .868, AGFI = 0.831, CFI = 0.993, and PGFI = .676) and a PGFI index comparable to that of the second model. Each item was removed based on one or more weaknesses due to:

- 1) modification index over the 5.0 threshold,
- 2) factor alpha coefficient below the 0.70 threshold, and
- 3) item does not logically fit with factor.

The final model has substantial amounts of item variance (R^2 ranged from 0.312 to 0.697) except for COMM_3 ($R^2 = 0.243$) and SCOPE_4 ($R^2 = 0.288$) (see Table 1). Item variance is an indicator of how well the latent variables (the factors) explain the variance in the observed variables (the items) and is measured by the squared multiple correlation (R^2) (Kelloway, 1998, p. 64) (closer to 1.0 indicates a better fit of the item with the factor). The standardized parameter estimates for the final model are listed as loadings in Table 1. The model parameters were significant ($p < .001$) for all variables (based on a significant t value for each) and each of the factors were significantly ($p < .01$) inter-correlated (see Table 2).

The inter-factor correlations for the final model were corrected for inter-correlation unreliability (see Table 2) using Lord and Novick's (1968) formula for corrected correlations (the observed correlation between the two factors divided by the product of the square root of their alpha reliabilities). The corrections resulted in one correlation approaching 1.0 (COMM with PART). This may imply multivariate multicollinearity, so the final model was subject to collinearity diagnostics using SPSS regression to regress each independent factor on all the other independent factors in the model. Tabachnick and Fidell (1996, p 87) suggest that factors with a conditioning index greater than 30 and two or more variance proportions greater than 0.50 are indicative of multicollinearity. The final model was below these thresholds, indicating that the factors are in fact each unidimensional.

Factor 1 Cronbach Alpha = 0.713	Loading	R²
COMM_1 Degree of understanding of the business by the IT function	0.657	0.432
COMM_2 Degree of understanding of IT by the business	0.638	0.408
COMM_4 Communication style used within the organization	0.578	0.334
COMM_5 Degree of knowledge sharing throughout the organization	0.558	0.312
COMM_3 Degree of richness of methods used for organizational learning	0.493	0.243
Factor 2 Cronbach Alpha = 0.822	Loading	R²
COMP_3 Degree and orientation of integrated IT and business measures	0.835	0.697
COMP_6 Frequency and formality of IT assessments and reviews	0.691	0.477
COMP_1 Focus of the metrics and processes to measure IT's contribution	0.667	0.445
COMP_7 Degree of continuous improvement practices	0.660	0.436

COMP_4 Degree of service level agreements	0.639	0.408
Factor 3 Cronbach Alpha = 0.740		
GOV_7 IT function's responsiveness to changing business needs	0.724	0.525
GOV_6 Integration of IT project prioritization	0.698	0.487
GOV_4 Basis of IT investment decisions	0.607	0.368
GOV_3 Basis of budgeting IT resources	0.594	0.353
Factor 4 Cronbach Alpha = 0.727		
PART_5 Perception of trust and value	0.850	0.723
PART_1 Business' perception of the role of IT	0.621	0.385
PART_3 Integrated sharing of risks and rewards	0.601	0.361
Factor 5 Cronbach Alpha = 0.714		
SCOPE_3 Degree of architectural integration	0.828	0.686
SCOPE_2 IT standards articulation and compliance	0.700	0.490
SCOPE_4 Degree of infrastructure transparency	0.536	0.288
Factor 6 Cronbach Alpha = 0.768		
SKILLS_1 Degree of an innovation culture	0.752	0.565
SKILLS_3 Degree of a change readiness culture	0.746	0.556
SKILLS_7 Ability to attract and retain IT staff with technical and business skills	0.681	0.463
Table 1 Final Model CFA Factor Loadings, Squared Multiple Correlations, and Alpha Coefficients		

	COMM	COMP	GOV	PART	SCOPE	SKILLS
COMM	1.000					
COMP	0.572 (0.747)	1.000				
GOV	0.580 (0.798)	0.506 (0.648)	1.000			
PART	0.660 (0.917)	0.510 (0.659)	0.545 (0.743)	1.000		
SCOPE	0.519 (0.727)	0.397 (0.518)	0.462 (0.635)	0.430 (0.597)	1.000	
SKILLS	0.466 (0.630)	0.557 (0.701)	0.462 (0.613)	0.443 (0.593)	0.416 (0.562)	1.000
Table 2 Model 3 Inter-factor Correlations and Corrected Correlations*						

* Corrected correlations in parentheses

Maturity Factors Compared to Each Other

The second research question sought to determine whether one or more Strategic Alignment Maturity factors are more mature in comparison to other factors. The means of each of the factors were compared to each other using paired-sample t-tests. (The variables that comprise each factor were averaged together to create an overall mean for each factor.) The overall mean and significance for each of the six factors resulting from the confirmatory factor analysis are listed in Table 3. The IT

Governance factor (GOV) has the highest mean (mean = 3.224). The results of the paired-sample t-tests determined that the mean of GOV was significantly higher (in all cases, $p < .01$) than each of the other means, meaning that, together, the management practices and strategic IT choices that comprise this factor have a significantly higher level of maturity relative to all of the other factors. The Competency and Value factor (COMP) has the lowest mean (mean = 2.483). Paired-sample t-tests determined that the mean of COMP was significantly lower ($p < .01$) than each of the factors except SKILLS ($p > .05$) meaning that, together, the management practices and strategic IT choices that comprise the COMP factor have a significantly lower level of maturity relative to all of the other factors except SKILLS (mean = 2.630).

Factor	Overall Mean	Significance compared to COMP	Significance compared to GOV
COMM	2.99	$p < .01$	$p < .01$
COMP	2.48	NA	$p < .01$
GOV	3.22	$p < .01$	NA
PART	2.97	$p < .01$	$p < .01$
SCOPE	2.90	$p < .01$	$p < .01$
SKILLS	2.63	$p > .05$	$p < .01$

Table 3 Overall Mean and Significance for the Six Factors

Interaction Effect of SAM Factors with Business Units

The third research question sought to determine whether the six Strategic Alignment Maturity factors significantly differ across the ten business units. To answer this question a mixed model repeated measures ANOVA (business unit x maturity factor) was run. Significant results were obtained for both the main effect of differences between maturity factors ($F(5, 530) = 15.311, p < .001$) and the interaction effect of maturity factors and business units ($F(9, 106) = 5.547, p < .001$). This finding provides further evidence of the validity of the SAM assessment instrument by showing that the instrument can detect differences in maturity factor patterns between companies. Figure 2 demonstrates the interaction effect of the SAM factors with each business unit (Unit 1 through Unit 10).

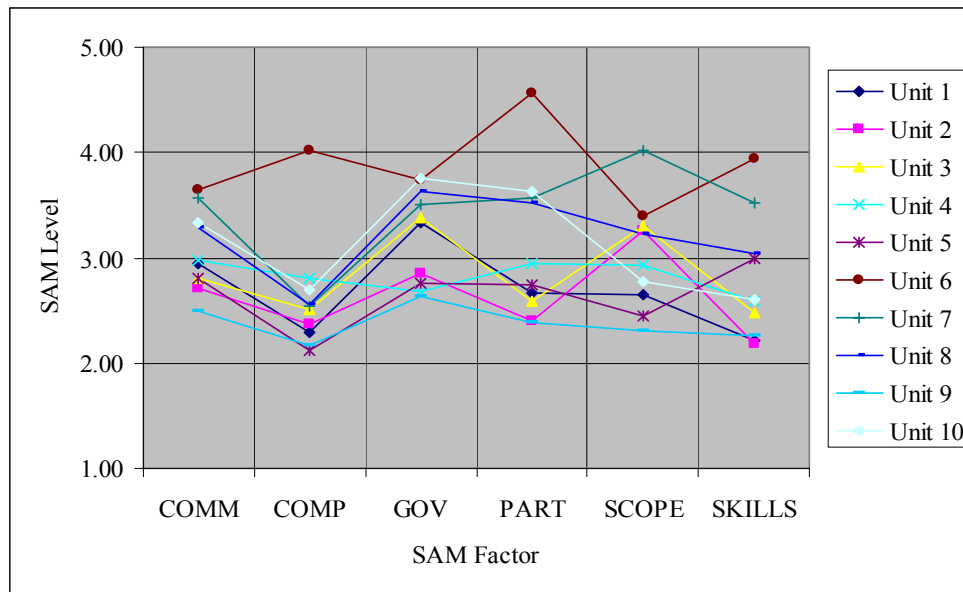


Figure 2. Interaction Effect of the SAM Factors With Business Units

DISCUSSION, IMPLICATIONS, AND CONCLUSIONS

The first research question, “What are the factors that comprise the Strategic Alignment Maturity construct?” was addressed by conducting an extensive literature review covering the cumulative research on strategic alignment as it pertains to the domain of Luftman’s (2000) Strategic Alignment Maturity model. An assessment instrument was developed to measure

Strategic Alignment Maturity. The instrument was evaluated using confirmatory factor analysis that reduced the Strategic Alignment Maturity model variable set from 39 items to 23 items for a more parsimonious representation of Strategic Alignment Maturity. Statistical evidence was provided to support the goodness-of-fit of the six factors (Communication Maturity, Competency and Value Measurement Maturity, Governance Maturity, Partnership Maturity, Scope and Architecture Maturity, and Skills Maturity) of the Strategic Alignment Maturity model.

The second research question “Are one or more Strategic Alignment Maturity factors more mature in comparison to each of the other factors?” was addressed by comparing the means for each factor across organizations. Support for this question was found with the GOV factor mean being significantly higher than the means of the other five factors and the COMP factor being significantly lower than the means of all the other factors except SKILLS. These findings indicate that the respondents perceive a greater maturity of Governance mechanisms in their organizations and a lower maturity of Competency and Value Measurement. Overall, respondents perceive Governance as an established and focused process (Level 3 of SAM model) and Competency and Value Measurement as a committed process (Level 2 of SAM model). These results are not surprising given the priority placed by organizations on governing IT rather than on measuring its value. Scholars suggest that assessing the value of IT is not well established (Myers, Kappelman, & Prybutok; 1997) and that demonstrating the effects of IT investments on performance has proven difficult to achieve (Mahmood & Mann; 2000); this may be indicative of Competency and Value Measurement’s relative overall low maturity level. Governance management practices have probably existed the longest, since decisions of how to allocate IT resources have always occurred in organizations while practices pertaining to measuring IT value, integrating disparate computer systems, and using IT implement competitive business strategies, for example, are relatively recent IT considerations. The longevity of Governance practices in organizations could have likely contributed to them being more mature.

The third research question, “Do companies differ in their level of the Strategic Alignment Maturity factors?” was addressed by performing a mixed model repeated measures ANOVA for each of the SAM factors across the ten business units. Support for this research question was found with significant results being obtained for both the main effect of differences between factors and the interaction effect of differences for the factors across the ten business units. This analysis indicates that there are significant differences between companies over all factors, there are significant differences across companies between factors, and that there is an interaction between companies and factors. This finding is important because it suggests that the SAM assessment instrument can be used to develop a maturity profile of an organization that can be used to identify the organization’s maturity level for each Maturity factor and that the maturity levels for each SAM factor can be improved upon by the organization.

This study has several limitations that should be mentioned which can provide opportunity for future research. The primary limitation of this research study is the restriction in range of companies ($n = 7$) and industries ($n = 3$), precluding generalizability of the results to the general population. Additionally, due to sample size limitations, this study did not benefit from the opportunity to modify some of the items excluded from the factor analysis to try to improve them. For example, rewording of items to clarify their intent was only possible during the pre-test and pilot phases. Additionally, the sample size at the organizational level ($n = 7$) precludes the ability of this study to make any generalizations at the organizational level. Also, with this sample size it did not make sense to control for organizational factors that have the potential to influence IT practices such as IT budget (Reich & Benbasat, 2000), and information intensity of the value chain (Kearns & Lederer, 1997), and other contingency variables including company size, structure, strategy, and the environment (Daft, 1997 p 359) which should be considered with a larger sample size.

Limitations with the research design include the fact that the SAM measurement instrument has not been cross-validated with a sample separate from the one used to initially validate it. Kelloway (1998) recommends that models that are modified from their original sample should be considered as exploratory until they can be cross-validated on an independent sample. Also, this study was unable to examine any firms with extreme levels of maturity, either low or high, and was therefore unable to learn any information about the effect of low or high maturity on knowing IT and business objectives or on the actual management practices and strategic IT choices of those firms. For example, are specific items from the six SAM components predominant in high maturity firms or lacking in low maturity firms?

This study contributed to the existing strategic alignment literature by investigating management practices and strategic IT choices that facilitate IT-business alignment to develop and validate an instrument to measure the degree to which those practices are in place in an organization. Knowing the maturity of their management practices and strategic IT choices in place to facilitate IT-business alignment should help organizations determine whether these practices and choices are appropriate and whether they want to improve them. The Strategic Alignment Maturity Assessment provides management with a tool to assess their alignment and then to improve it by implementing best practices from more mature levels provided in the instrument.

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