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Development and Validation of an Instrument to Measure Maturity of IT Business Strategic Alignment Mechanisms

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ABSTRACT

Achieving IT-business alignment has been a long-standing, critical, information management issue. A theoretical framework of the maturity levels of management practices and strategic IT choices that facilitate alignment was empirically tested and validated. Confirmatory factor analysis (CFA) validated 6 factors and identified 22 indices to measure strategic alignment maturity. A mixed model repeated measure analysis of variance (ANOVA) obtained significant results for both the main effect and interaction effect of differences for the 6 maturity factors across the 11 business units. Regression analysis found a positive association between overall strategic alignment maturity and respondents' self-rated maturity. These exploratory findings show promise for the assessment instrument to be used as a diagnostic tool for organizations to improve their IT-business alignment maturity levels.

Keywords: *business strategy; IS evolution; IS integration; IS maturity; IT alignment; stage theory; strategic alignment*

INTRODUCTION

IT and business leaders are continually looking to align their IT and business strategies. In their seventh annual survey, Computer Sciences Corporation (2005) reported that IT-business strategic alignment has persisted among the top-ranked issues of chief financial officers. In another study, over 300 Society for Information Management (SIM) executives ranked IT-business alignment as their number one management concern (Luftman & McLean, 2004). Research has shown that IT-business strategic alignment contributes to higher levels of organizational performance (Chan, Huff, Barclay, & Copeland, 1997) and perceived business value from IT (Tallon, Kraemer, &

Gurbaxani, 2000). Lee and Pai (2003) found that the maturity of the information systems function has a strong effect on strategic information systems planning and that IT-business alignment improves with the effectiveness of a firm's planning process. Clearly, there is a need and benefit in determining mechanisms to facilitate the alignment of the IT and business functions.

We propose that IT-business strategic alignment can be facilitated by the management practices and strategic IT choices that an organization makes. There are different levels of implementation for these mechanisms, referred to as maturity. Luftman (2000) proposed a framework called strategic alignment maturity (SAM) that exhibits these organizational mechanisms. We used this framework as a model to develop and validate an instrument to measure SAM. Luftman's SAM framework includes five conceptual levels of strategic alignment maturity modeled after the capability maturity model (CMM) of software quality developed by the Software Engineering Institute at Carnegie Mellon (Humphrey, 1988). The SAM framework models the CMM in that the SAM describes key management practices and strategic IT choices at each of five levels. In the SAM framework, maturity levels are composed of six key areas: communication, competency and value measurement, governance, partnership, scope and architecture, and skills. Each key area identifies a grouping of related mechanisms that, when performed collectively, are considered important for enhancing IT-business alignment capability. These areas form not only mechanisms, but also criteria that measure achievement of a maturity level. These areas are cumulative, meaning that an organization at level three, for example, will meet the criteria of both levels two *and* three.

The five levels of strategic alignment maturity are as follows:

1. Initial/ad hoc process: This is the lowest level of maturity; management practices and strategic IT choices to facilitate alignment do not exist or are ad hoc in nature.
2. Committed process: Management practices and strategic IT choices to facilitate alignment exist at a low level in the organization.
3. Established focused process: Management practices and strategic IT choices to facilitate alignment exist at a moderate level in the organization.
4. Improved/managed process: Management practices and strategic IT choices to facilitate alignment exist at a strong level in the organization.
5. Optimized process: Management practices and strategic IT choices to facilitate alignment are fully integrated and coadaptive between the business and IT function.

LITERATURE REVIEW

Several multistage or multilevel models have been proposed to describe various concepts related to IT-business alignment. King and Teo's (1997) model consists of four stages or levels of growth for the evolution of information systems planning. The premise behind their model is that organizations have increasing levels of integration between business planning and information systems planning. King and Teo (1997) proposed that 10 benchmark variables were indicative of each of the four different stages of planning integration, and the degree to which each benchmark variable was present in an organization was associated with the perceived level of integration the organization placed themselves. More recently, Jeffery and Leliveld (2004) proposed the IT portfolio management maturity model as a tool for assessing best practices as defined by four stages, and van der Raad, Soetendal, Perdeck, and van Vliet (2005) proposed that IT architecture is comprised of multiple aspects that represent three different maturity levels, depending on the number of aspects being used and the scope of their use within an organization.

An underlying motivation of our research is how and why organizations change from being less strategically aligned to being more strategically aligned. One possible impetus of change is explained by the punctuated equilibrium perspective (Gersick, 1991). In this view,

organizations shift from one maturity level to another through "purposeful enactment" (Van de ven & Poole, 1995) of top management in the form of competitive selection of organizational routines. Another possible impetus of change, explained by evolutionary 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, McAulay, & Mittal, 1999).

We propose that SAM can be influenced by identifiable organizational initiatives (for example by conducting an assessment of maturity mechanisms and making deliberate efforts to implement specific management practices and strategic IT choices) that encourage (or perhaps discourage) implementation and ongoing use of the processes and mechanisms associated with strategic alignment, resulting in organization-led increased SAM.

The primary goal of our research was to validate a model for assessment of strategic alignment mechanism maturity. To that end, our primary research question was "Can a survey be developed to assess different levels of strategic alignment maturity with acceptable reliability and validity using the SAM theoretical framework"? In addition to identifying and validating an instrument to measure strategic alignment maturity, an obvious validation of this research is to determine whether companies have different levels of maturity. Therefore, an additional research question was "Do companies differ in their level of the strategic alignment maturity factors"?

The following is a brief description of each of the components of the SAM framework.

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. 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 of 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. Henderson, Venkatraman, and Oldach (1996) suggested 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. Research suggests that measures of business contribution should be multidimensional (Maltz, Shenhar, & Reilly, 2003) and IT and business measures should be integrated (Luftman, Bullen, Liao, Nash, & Neumann, 2004, p. 382; Van Der Zee & De Jong, 1999).

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) suggested that governance is a valuable mechanism to facilitate IT-business alignment. They saw governance as a mechanism for specifying IT decision-making capabilities within the organization and with strategic alliances and partners.

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) suggested 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.

Skills maturity refers to the organization's cultural climate toward change and innovation. 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

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 the survey assessment instrument.

The SAM framework (Luftman, 2000) suggests management practices and strategic choices that may act as measurement items for the different components of strategic alignment maturity. Since our study was the first to empirically test a measure of strategic alignment maturity and there was no existing validated measurement instrument, it was necessary to develop one. Measurement items were developed from the SAM framework and from existing literature (see Sledgianowski, 2004 for the operationalization of the scale items of the strategic alignment maturity measurement instrument).

The strategic alignment maturity instrument consisted of 39 items. Each survey item consisted of a statement and a five-choice answer scale, with each answer choice representing a different level of maturity, similar to the concept of benchmark variables employed by King and Teo (1997). A choice of one indicated the lowest level of maturity, and a choice of five indicated the highest level of maturity (see Appendix A for a sample of scale items).

The survey also contained a single item to measure a respondent's perceived overall strategic alignment maturity level. This indicator was used in our analysis to ascertain how well the mechanisms to measure strategic alignment maturity from the assessment instrument correlated with self-rated maturity levels. Even though this is a single-item scale, we believe that it provides an accurate assessment, given the high level of authority and responsibilities of the individuals who completed the questionnaire. Other research has used executive-level respondent's perceptions to measure the existence of alignment within his or her firm (i.e. Reich & Benbasat, 1996; Tallon et al., 2000)

Instrument Development

Because we used nominal anchors for our scales, we tested the assumption that our nominal categories reflected an underlying continuum consistent with our a priori rankings of each category. We used a technique similar to classic item analysis. For each item in a particular scale consisting of k items, we used the a priori scale values to create a score based on k-1 items. The five options for the kth item were then used as the levels of a one-way ANOVA. We assessed the significance of the resulting F-value, and also examined the means to determine whether the rank order of means for the five categories corresponded to the a priori order. For all items examined the F-test was significant, indicating that the a priori categories were differentiating a total score based on the a priori scoring system for k-1 items. We found

that, in general, the a priori categories corresponded to the empirical values of the means for the same categories.

Pilot Test of the Questionnaire

A pilot test was administered to 23 IT and business executives within one organization, revealing that all items were interpreted as intended, resulting in no changes to the final questionnaire. An independent samples t-test was performed to determine whether there was a significant difference in overall maturity level (calculated as the overall mean of the six factors) and self-rated maturity level (a single item indicator of respondents' perception of their firm's maturity level) between the pilot data set and the final data set. There were no significant differences in scores between the two groups. Because no additional changes to the questionnaire were necessary, and because the pilot data was collected in a manner consistent with the other organizations in the study with no significant differences between the two groups, the data from this pilot test was included in the final data set.

Data Collection

A survey was conducted of 153 IT and business executives from 11 business units across eight organizations. The respondents completed the assessment instrument as part of a strategic alignment assessment. The assessment program was offered to all organizations which were current members of The Conference Board or SIM. According to the Web sites of these two organizations, SIM membership consists of over 3,000 IT leaders and The Conference Board membership consists of executives from over 2,000 companies.

Membership in the two organizations may overlap, as some executives may belong to both.

The eight organizations participating in this study included one government agency, two chemical manufacturers and five firms in the financial and insurance industry. Each organization was located in the United States. 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.

Of the 153 completed questionnaires received, 150 were usable. Of these, 83 self-identified as belonging to a business function, and 67 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."

Data Screening

Prior to analysis, the data were screened for missing values, outliers, and normal distribution of the variables. Missing values and do not know responses were replaced with the mean value of the other items within the same category.

The means for the 39 survey questions ranged from 2.01 to 3.73, and the standard deviations ranged from 0.74 to 1.31. In general, items were positively and significantly intercorrelated with no indication of univariate multicollinearity.

The test for multivariate skewness was significant ($z = 2.269$, $p = 0.023$), indicating the existence of multivariate skewness. Jaccard and Wan (1996, p. 76) found that statistical estimation methods used to analyze data, such as the maximum likelihood method used in confirmatory factor analysis, may be sensitive to multivariate skewness.

RESULTS

To determine whether our survey instrument demonstrated acceptable reliability and validity, and whether our instrument was able to differentiate maturity levels among organizations, CFA and ANOVA were used to analyze the collected data. To determine whether our instrument demonstrated concurrent validity, bivariate correlations and multiple regression analyses were evaluated.

Table 1. Goodness-of-fit indices for the five factor(1) and six factor (2) models

#	$\chi 2$	Df	p	RMSEA	SRMR	GFI	AGFI	CFI	NNFI	PGFI	PNFI
1	1004.77	687	.00	.055	.07	.74	.71	.84	.83	.65	.62
2	189.76	194	.57*	.000	.05	.90	.87	.99	.99	.69	.72

** a nonsignificant chi-square is desired*

Confirmatory Factor Analysis of Maturity Constructs

Due to the existence of multivariate skewness, the robust maximum likelihood estimation feature of LISREL 8.51 CFA was used. The robust ML uses the ML estimates obtained under the normality assumption, but the chi-square is corrected for nonnormality 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 first model, Model 1, comprised of the a priori 39 indicators within the 6 components resulted in a poor fit to the data (see Table 1). The second model, Model 2, was derived from Model 1 by recursively dropping items that shared a high degree of residual variance with other items (Gefen, Straub, & Boudreau, 2000). Before dropping each item, a decision was made as to whether it made theoretical sense to drop the item. Dropping the items resulted in a good fit for the collected data (see Table 1).

The overall degree of fit is acceptable as evidenced by all of the fit indices being at or better than their minimum threshold value except AGFI (see Table 1).

Convergent validity and unidimensionality demonstrate the degree to which the factor is represented by the items that comprise it. Model 2 showed acceptable convergent validity and unidimensionality, as measured by assessing factor loadings, t-values, and modification indices.

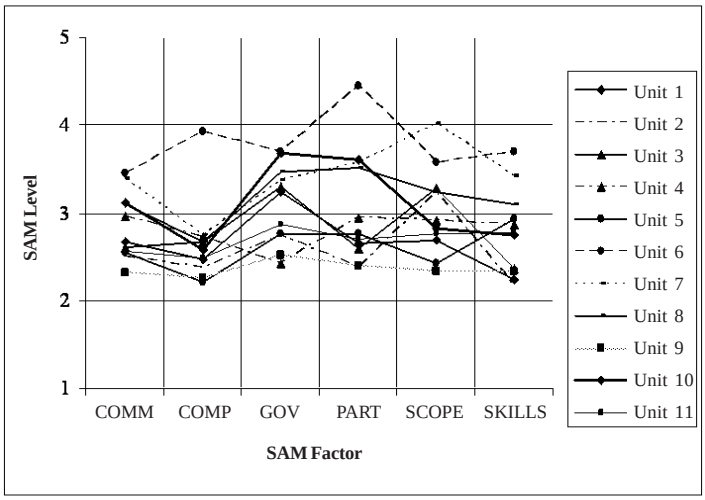
The standardized parameter estimates for Model 2 are listed as loadings in Appendix B. The loadings ranged from 0.519 to 0.847. The model parameters were significant ($p < .001$) for all variables. All standardized residuals were within the threshold of |2.58| except for two (-3.88 and 2.73). Four modification indices for Lambda-X were above the upper limit of 5.0 (Segars, 1997): COMM_1 on PART (9.00), SKILLS_1 on COMM (7.70), SKILLS_2 on PART (7.42), and COMM_3 on PART (5.75).

Next, further convergent validity was assessed using Cronbach's coefficient alpha, composite factor reliability, and average variance extracted (AVE). For Model 2, all results exceeded the recommended value of 0.70 for the coefficient alpha and composite reliability measures (Segars, 1997). Model 2 had AVE values meeting the 0.50 lower threshold except SKILLS at 0.49 and COMM at 0.40, indicating

Table 2. Reliabilities and average variance extracted for all factors

Factor	Alpha reliability	Composite factor reliability	Average variance extracted
COMM	0.71	0.72	0.40
COMP	0.83	0.83	0.50
GOV	0.73	0.75	0.50
PART	0.74	0.75	0.50
SCOPE	0.73	0.75	0.50
SKILLS	0.79	0.79	0.49

Figure 1. Interaction effect of the SAM factors with business units



that for these two factors, the total variance for each factor due to error is larger than total variance due to the measurement (see Table 2).

Discriminant validity was assessed using two techniques. The first used the chi-square difference test to compare each individual factor to another by constraining the estimated correlation parameter between the two factors to 1.0 so that all the items appear to measure the same construct, and then comparing the results to those with the two factors unconstrained. If the difference in the change in chi-square between the constrained and unconstrained model is significantly lower ($p < .05$), this indicates that the individual factors are not perfectly correlated, and that discriminant validity is achieved (Bagozzi & Phillips, 1991). All chi-square differences were significant at the the $p < .01$, indicating strong support for discriminant validity. The second method of discriminant validity used analysis of variance, and is described in the next subsection.

Interaction of SAM Factors with Business Units

To answer our second research question, "Do companies differ in their levels of the strategic alignment maturity factors?", it was necessary to determine whether the six SAM factors significantly differed across the 11 business units. A necessary, but not sufficient condition, for construct validity is discriminant validity. In this case, the question was whether business units had reliably different patterns of SAM. If they did not, the results would cast doubt on the validity of the six factors to provide diagnostic information. To answer this question, a mixed-model repeated measures ANOVA was run to compare means across the 11 business units for the six SAM factors. The model assessed differences among business units (a between factor), differences among the six factors (a within-factor), and the interaction between the two factors. Differences between business units reflect the difference in the average score across the six factors. Differences between the six factors reflect differences among the SAM means across business units. However, the primary interest in this analysis was the interaction between business units and SAM factor scores. The purpose of the analysis was not to determine which factors differed for which organizations, but merely to determine whether the patterns of SAM scores var-

Table 3. Bivariate correlations of factors and calculated overall maturity

	COMM	COMP	GOV	PART	SCOPE	SKILLS	OVERALL
SELF-RATING	.649*	.509*	.353*	.474*	.471*	.348*	.604*

ied by business unit. This method is similar to that proposed by Stanley (1961) and additional methods discussed by Saal, Downey, and Lahey (1980), in which a mixed model ANOVA is used for the assessment of the quality of ratings.

The mixed-model repeated measures ANOVA resulted in significant results for the main effect ($F(1, 139) = 11.038$, $p < .001$), revealing a reliable difference for business units in the means across the six SAM factors. More importantly, there was a significant result for the interaction effect of maturity factors with business units ($F(10, 139) = 2.580$, $p < .01$). Figure 1 shows the pattern of means on the six maturity factors for the 11 business units. (Unit 1 through Unit 11).

Assessing goodness-of-fit, convergent validity, unidimensionality, factor reliability, and discriminant validity, as a whole, the six factors comprising

Model 2 appear to serve as moderately valid indicators of the concepts they represent, except some of the COMM items failed to significantly converge on the COMM factor. Discriminant validity tests for Model 2 provided mixed results, with the AVE-relative-to-factor-correlations test unable to discern the COMM factor from four of the other five factors, but with the chi-square difference test significant across all factors.

Relationship between Measured Mmaturity and Self-Rated Maturity

The evaluation of the mechanisms to facilitate IT-business strategic alignment can be further enriched by answering the question "Is there a relationship between the measured strategic alignment maturity level and the self-rated level of strategic alignment maturity?" In order to examine the concurrent validity of the maturity measurement instrument, we examined this relationship using bivariate correlations and simple and multiple linear regression with SPSS v. 10.0.

Two-tailed bivariate correlations between self-rated maturity level, the six factors from Model 2, and the overall computed maturity level were analyzed. The overall computed maturity level was a single value for each of the 150 cases, computed by taking the mean of each of the 22 indicators. Each of the bivariate relationships was significant (see Table 3).

Simple linear regression was run between self-rated maturity level as the dependent variable, and overall computed maturity level as the independent variable. The simple linear regression model $R^2 = .36$, $F(1, 149) = 85.16$ was significant ($p < .01$). This result provides further evidence that, overall, the levels used to measure the maturity of mechanisms that facilitate IT-business alignment are associated with IT and business executives perceptions of IT-business alignment maturity levels within their organization.

Standard multiple linear regression was run between self-rated maturity level as the dependent variable and each of the six factors from Model 2 as the independent variables (IV) (see Table 4). Only three (COMM ($sr^2 = .168$), COMP ($sr^2 = .028$), and SCOPE ($sr^2 = .026$)) of the six IVs contributed significantly to prediction of self-rated maturity level. The six IVs in combination contributed another .24 in shared variability. Altogether, 47% (45% adjusted) of the variability in self-rated maturity level was predicted by knowing scores on the six IVs.

Although the correlations between self-rated maturity level and the GOV, PART, and SKILLS factors were significant (see Table 4), these three IVs did not contribute significantly

Table 4. Results of regression analysis for self-rated maturity and six factors

Factor	**β**	**t**	**Significance**		
Commuications Maturity	0.461	5.429	0.000		
Competency Maturity	0.169	2.065	0.041		
Governance Maturity	-0.073	-0.899	0.370		
Partnership Maturity	0.079	0.914	0.362		
Scope Maturity	0.162	2.013	0.046		
Skills Maturity	-0.019	-0.240	0.811		
Model Summary	**R**	**R^2**	**Adjusted R^2**	**Std. Error of the Estimate**	
	0.683	0.467	0.445	0.666	
Analysis of Variance					
	Sum of Squares	**df**	**Mean Square**	**F**	**Significance**
Regression	56.673	6.000	9.445	21.292	0.000
Residual	64.767	146.000	0.444		
Total	121.440	152.000			
Dependent variable: Self-rated Maturity Level					

to regression. Apparently, the relationships between self-rated maturity level and GOV, PART, and SKILLS are mediated by the relationships between COMM, COMP, SCOPE and self-rated maturity.

DISCUSSION

The first research question, "Can a survey be developed to assess strategic alignment maturity acceptable reliability and validity using the SAM theoretical framework?" was addressed by conducting an extensive literature review, and developing and validating an assessment instrument to measure SAM. The instrument was evaluated using confirmatory factor analysis that reduced the SAM model variable set from 39 items to 22 items for a more parsimonious representation of SAM. Statistical evidence was provided to support the goodness-of-fit of the six factors of the SAM framework.

The second 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 11 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 11 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 SAM factor, and that the maturity levels for each SAM factor can be improved upon by the organization.

The research instrument developed, validated, and tested in this study provides a tool that appears to be useful for practitioners and managers to assess the current maturity level of the management practices and strategic IT choices currently in place in their organization.

Further testing of this instrument may show that firms can implement the mature alignment management practices to further facilitate IT-business alignment. For example, most firms were identified as having SAM between level one and level three. Firms at this level may want to implement the more mature items from the instrument as best practices to facilitate greater alignment.

Luftman (2000) offers a six-step SAM assessment process that practitioners and managers can apply. The SAM assessment instrument can be used as a tool in this process to help a firm understand its IT-business linkage, and to determine the gaps. The results of a firm's initial assessment can be used as a starting point for communications between IT and business executives to develop a plan to achieve more mature alignment.

Our research shows that different firms have different levels of alignment maturity. This implies that the SAM instrument may provide some specific best practices to be considered by practitioners and managers. For example, an indicator of more mature architectural integration is an infrastructure that is integrated across functional units and with business partners. Weill and Broadbent (1998, pp. 60-61) suggest that firms with an IT infrastructure that links their business units and integrates their different business processes have stronger revenue growth than those firms that have a less extensive IT infrastructure. As another example of a potential best practice, we found that a more mature mechanism to facilitate strategic alignment is frequent and formal IT assessments and reviews. Evaluation of IT investments, including formal and regular reviews, is positively related to IT-business alignment (Tallon et al., 2000).

LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

Like any research, this study has several limitations, which should be mentioned, that can provide opportunity for future research. The primary limitation of this research study is the restriction in range of companies (n =8) 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. With the limited 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), that should be considered with a sample containing a greater number of organizations.

A major limitation with this research design is that the SAM measurement instrument has not been cross-validated with a sample separate from the one used to initially validate it. Kelloway (1998) recommended 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 provide any information about the effect of low or high maturity. For example, are specific mechanisms from the SAM components more common in predominantly high-maturity firms or lacking in predominantly low-maturity firms? Several of the items comprising the competency component were not able to distinguish between levels four and five; while not an issue in this study, the answer choices for these two levels should be revised to ensure a difference.

Although this study makes a contribution to the strategic alignment research by showing concurrent validity between the measured overall maturity rating and the respondents' self-rated maturity, additional work should be done to examine why the governance, partnership, and skills factors did not contribute significantly to respondents self-rated maturity level.

Additionally, work should be carried out to examine the communications component, to improve its properties, and ensure that it adequately measures the relevant construct.

Calling on previous stages of growth research to provide ideas for future research, the strategic alignment literature would benefit from applying to the SAM model some of the research questions addressed by Teo and King (1997) in their study of IT-business planning integration. For example,

1. Over time, does strategic alignment maturity follow an evolutionary pattern, with a firm moving from lower levels of maturity to higher levels?
2. Do firms move from one level of maturity to another due to a competitive selection of organizational routines initiated by "purposeful enactment" of top management, as proposed by punctuated equilibrium theory?
3. Do organizations go through each of the five levels of strategic alignment maturity or can the levels be bypassed?
4. What are the relative times spent at each SAM level, and the reason for movement to the next level of maturity?

Another area for future research includes examining managerial practices that facilitate IT-business alignment at the operational level. The literature suggests that all levels of the organization need to be concerned with how IT can enable and drive the objectives of the firm. For example, Middleton & Harper (2004) suggest that the degree to which the employees' goals support their organization's goals may influence the success of information system implementations within the company. They suggest that when the goals of employees are aligned with those of their organization, employees are more likely to act in a way to improve their organization. Future research could investigate management mechanisms at the operational level that facilitate alignment of employees' goals with those of their organization.

CONCLUSION

IT-business strategic alignment literature encompasses different aspects of management practices and strategic IT choices made by organizations to facilitate alignment. What distinguishes this study from other studies is that it is the first research of its kind to incorporate these different aspects into an assessment instrument based on a model using multiple criteria and multiple levels to represent different degrees of alignment, from less mature to more mature.

This study contributes to the existing strategic alignment literature by investigating management practices and strategic IT choices that facilitate IT-business alignment, and by developing and validating an instrument to measure the degree to which those mechanisms are in place in an organization

This exploratory research suggests that the maturity assessment instrument may be a useful tool to help organizations assess their strategic alignment maturity and to improve it by implementing best practices from more mature levels provided in the instrument, and as such, warrants further testing of the instrument. Knowing the maturity of their management practices and strategic IT choices in place to facilitate IT-business alignment may help organizations determine whether these practices and choices are appropriate and whether they want to improve them.

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REFERENCES

Armenakis, A. A., Harris, S. G, & Mossholder, K. W. (1993). Creating readiness for organizational change. *Human Relations*, *46*(6), 681-702.

Bagozzi, R. P., & Phillips, L. W. (1991). Assessing construct validity in organizational re-

search. *Administrative Science Quarterly*, *36*, 421-458.

Calhoun, K. J., & Lederer, A. L. (1990). From strategic business planning to strategic information systems planning: The missing link. *Journal of Information Technology Management*, *1*(1), 1-5.

Chan, Y. E., Huff, S. L., Barclay, D. W., & Copeland, D. G. (1997). Business strategic orientation, information systems strategic orientation, and strategic alignment. *Information Systems Research*, *8*(2) 125-150.

Churchill, G. A. (1979). A paradigm for developing better measures of marketing constructs. *Journal of Marketing Research*, *16*(1), 64-73.

Computer Sciences Corporation. (2005). *Technology issues for financial executives*. 2005 Annual Report.

Daft, R. L. (1997). *Management*. Fort Worth, TX: Dryden Press.

Ferrando, P. J., & Lorenzo, U. (2000). Unrestricted vs. restricted factor analysis of multidimensional test items: Some aspects of the problem and some suggestions. *Psicologica: International Journal of Methodology and Experimental Psychology*, *21*, 301-323.

Gefen, D., Straub, D. W., & Boudreau, M. (2000). Structural equation modeling and regression: Guidelines for research practice. *Communications of the Association of Information Systems*, *4*(7), 1-77.

Gersick, C .J. (1991). Revolutionary change theory: A multilevel exploration of the punctuated paradigm. *Academy of Management Review*, *16*(1), 10-36.

Henderson, J. C. (1990). Plugging into strategic partnerships: The critical IS connection. *Sloan Management Review*, *31*(3) 7-18.

Henderson, J. C., & Venkatraman, N. (1993). Strategic alignment: Leveraging information technology for transforming organizations. *IBM Systems Journal*, *32*(1), 4-16.

Henderson, J. C., Venkatraman, N., & Oldach, S. (1996). Aligning business and IT strategies. In J. Luftman (Ed.), *Competing in the information age* (pp. 21-42). New York: Oxford University Press.

Humphrey, W. S. (1988). Characterizing the software process: A maturity framework. *IEEE Software*, *5*(2), 73-79.

Jaccard, J., & Wan, C. K. (1996). *Liseral approaches to interaction effects in multiple regression*. Newbury Park, CA: Sage.

Jeffery, M., & Leliveld, I. (2004). Best practices in IT portfolio management. *Sloan Management Review*, *45*(3), 41-49.

Jöreskog, K., & Sörbom, D. (2000). *LISREL 8.51* (Computer Software). Chicago: Scientific Software International, Inc.

Kearns, G. S., & Lederer, A. L. (1997). Alignment of information systems plans with business plans: The impact on competitive advantage. In *America's Conference on Information Systems.*

Keen, P. G. (1996). Do you need an IT strategy? In J. Luftman (Ed.), *Competing in the information age*. New York: Oxford University Press.

Kelloway, E. K. (1998). *Using LISREL for structural equation modeling.* Thousand Oaks, CA: Sage.

King, W. R., & Teo, T. S. H. (1997). Integration between business planning and information systems planning: Validating a stage hypothesis. *Decision Sciences*, *28*(2), 279-308.

Lee, G. G., Pai, J. (2003). Effects of organizational context and intergroup behaviour on the success of strategic information systems planning: An empirical study. *Behaviour and Information Technology*, *22*(4), 263-280.

Luftman, J. N. (2000). Assessing business-IT alignment maturity. *Communications of the Association of Information Systems*, *4*(14), 1-50.

Luftman, J. N. (2003). *Competing in the information age: Align in the sand.* New York: Oxford University Press.

Luftman, J. N., Bullen, C. V., Liao, D., Nash, E., & Neumann, C. (2004). *Managing the information technology resource: Leadership in the information age*. New York, NY: Prentice Hall.

Luftman, J. N., & McLean, E. (2004). Key issues for IT executives. *MIS Quarterly Executive*,

3(2), 89-104.

Luftman, J. N., Papp, R., & Brier, T. (1999). Enablers and inhibitors of business-IT alignment. *Communications of the Association for Information Systems*, *1*(11), 1-33.

Maltz, A. C., Shenhar, A. J., & Reilly, R. R. (2003). Beyond the balanced scorecard: Refining the search for organizational success measures. *Long Range Planning*, *36*, 187-204.

Middleton, P., & Harper, K. (2004). Organizational alignment: A precondition for information systems success? *Journal of Change Management*, *4*(4), pp. 327- 338.

Papp, R. (1999). Business-IT alignment: Productivity paradox payoff? *Industrial Management and Data System*, *99*(8) 367-373.

Reich, B. H., & Benbasat, I. (1996). Measuring the linkage between business and information technology objectives. *MIS Quarterly*, *20*(1), 55-81.

Reich, B. H., & Benbasat, I. (2000). Factors that influence the social dimension of alignment between business and information technology objectives. *MIS Quarterly*, *24*(1), 81-114.

Rockart, J. F., Earl, M. J., & Ross, J. W. (1996, Fall). Eight imperatives for the new IT organization. *Sloan Management Review*, 43-55.

Ross, J. W., Beath, C. W., & Goodhue, D. L. (1996, Fall). Develop long- term competitiveness through IT assets. *Sloan Management Review*, 31-42.

Saal, F. E., Downey, R.G., & Lahey, M.A. (1980). Rating the ratings: Assessing the psychometric quality of rating data. *Psychological Bulletin, 88*, 413-428.

Segars, A. (1997). Assessing the unidimensionality of measurement: A paradigm and illustration within the context of information systems research. *Omega*, *25*(1), 107-121.

Sledgianowski, D. (2004). *Identification of factors affecting the maturity of IT-business strategic alignment*. Doctoral dissertation, Stevens Institute of Technology, NJ.

Stanley, J. C. (1961). Analysis of unreplicated three-way classification with applications to rater bias and trait independence. *Psychometrika*, *26*, 205-219.

Tabachnick, B.G., & Fidell, L.S. (1996).*Using multivariate statistics* (3rd ed.). NY: HarperCollins.

Tallon, P. P., Kraemer, K. L., & Gurbaxani, V. (2000).Executives' perceptions of the business value of information technology: A process-oriented approach. *Journal of Management Information Systems*, *16*(4), 145-173.

Teo, S. H., & King, W. R. (1997). Integration between business planning and information systems planning: An evolutionary-contingency perspective. *Journal of Management Information Systems*, *14*(1), 185-214.

Van de ven, A. H., & Poole, M. S. (1995). Explaining development and change in organizations. *Academy of Management Review*, *20*(3), 510-540.

Van der Raadt, B., Soetendal, J., Perdeck, M., & van Vliet, H. (2004). Polyphony in architecture. In *Proceedings of the 26th International Conference on Software Engineering, IEEE*, pp 533-542.

Van Der Zee, J. T. M., & De Jong, B. (1999). Alignment is not enough: Integrating business and information technology management with the Balanced Business Scorecard. *Journal of Management Information Systems*, *16*(2), 137-156.

Weill, P., & Broadbent, M. (1998). *Leveraging the new infrastructure: How market leaders capitalize on information technology*. Boston: Harvard Business School.

Zeitz, G., McAulay, B., & Mittal, V. (1999). Distinguishing adoption and entrenchment of management practices: A framework for analysis. *Organization Studies*, *20*(5), 741-776.

APPENDIX A.

Example of Questionnaire Item

The following statements pertain to IT investment decisions. Our IT investment decisions are primarily based on IT's ability to:

1) Reduce costs.
2) Increase productivity and efficiency as the focus.
3) Traditional financial reviews. IT is seen as a process enabler.
4) Business effectiveness is the focus. IT is seen as a process driver or business strategy enabler.
5) Create competitive advantage and increase profit. Our business partners see value.
6) N/A or do not know.

The following statements pertain to the use of integrated IT and business metrics to measure IT's contribution to the business.

1) We do not measure the value of our IT business investments, or do so on an ad-hoc basis.
2) The value measurements for IT and business are not linked. We have limited or no formal feedback processes in place to review and take action based on the results of our measures.
3) The value measurements for IT and business are starting to be linked and formalized. We are also starting to have formal feedback processes in place to review and take action based on the results of our measures.
4) We formally link the value measurements of IT and business. We have formal feedback processes in place to review and take action based on the results of our measures, and to assess contributions across functional organizations.
5) We use a multidimensional approach, with appropriate weight given to IT and business measures. We have formal feedback processes in place to review and take action based on the results of our measures. These measures are extended to our external partners (e.g., vendors, outsourcers, customers).
6) N/A or do not know.

(Note: Contact jluftman@stevens-tech.edu regarding full access to survey)

APPENDIX B.

CFA Factor Loadings

Indicator	Description	Loading
Communications Maturity		
COMM_1	Degree of understanding of the business by the IT function	0.67
COMM_2	Degree of understanding of IT by the business	0.67
COMM_3	Degree of richness of methods used for organizational learning	0.52
COMM_4	Communication style used within the organization	Dropped
COMM_5	Degree of knowledge sharing throughout the organization	0.64
COMM_6	Use of IT-business liaisons	Dropped
Competency and Value Maturity		
COMP_1	Focus of the metrics and processes to measure IT's contribution	0.69
COMP_2	Focus of the metrics and processes to measure business contribution	0.67
COMP_3	Degree of and orientation of integrated IT and business measures	0.81
COMP_4	Degree of service level agreements	Dropped
COMP_5	Frequency and formality of benchmarking practices	Dropped
COMP_6	Frequency and formality of IT assessments and reviews	0.69
COMP_7	Degree of continuous improvement practices	0.66
COMP_8	Contribution of IT to strategic goals	Dropped
Governance Maturity		
GOV_1	Degree of business strategic planning with IT involvement	Dropped
GOV_2	Degree of IT strategic planning with business involvement	Dropped
GOV_3	Basis of budgeting IT resources	0.64
GOV_4	Basis of IT investment decisions	0.76
GOV_5	Frequency formality, and effectiveness of IT steering committees	Dropped
GOV_6	Integration of IT project prioritization	0.72
GOV_7	IT function's responsiveness to changing business needs	Dropped
Partnership Maturity		
PART_1	Business' perception of the role of IT	0.63
PART_2	Role of IT in strategic business planning	Dropped
PART_3	Integrated sharing of risks and rewards	0.63
PART_4	Formality and effectiveness of partnership programs	Dropped
PART_5	Perception of trust and value	0.85
PART_6	Reporting level of business sponsor/champion	Dropped
Scope and Architecture Maturity		
SCOPE_1	Technological and strategic sophistication of primary systems/applications	Dropped
SCOPE_2	IT standards articulation and compliance	0.71
SCOPE_3	Degree of architectural integration	0.82
SCOPE_4	Degree of infrastructure transparency	0.58
SCOPE_5	Degree of infrastructure flexibility	Dropped
Skills Maturity		
SKILLS_1	Degree of an innovation culture	0.74
SKILLS_2	Degree of integrated locus of power in IT-based decisions	0.66
SKILLS_3	Degree of a change readiness culture	0.71
SKILLS_4	Degree of opportunity for skills enrichment through job transfer	Dropped
SKILLS_5	Degree of opportunity for skills enrichment through cross-training or job rotation	Dropped
SKILLS_6	Degree of interpersonal interactions across IT and business	Dropped
SKILLS_7	Ability to attract and retain IT staff with technical and business skills	0.68

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