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# Strategic Alignment Maturity: A Structural Equation Model Validation

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# STRATEGIC ALIGNMENT MATURITY: A STRUCTURAL EQUATION MODEL VALIDATION

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## ABSTRACT

Addressing the IT business alignment conundrum remains an important area to investigate. This is demonstrated by research over the past three decades that has consistently identified IT-business alignment as a pervasive and persistent problem. An even more compelling reason is empirical evidence demonstrating the relationship between IT-business alignment and firm performance. Recent research has found an association between higher levels of IT-business alignment maturity (using the lead authors' maturity assessment) and higher levels of firm performance. These findings add credence to the importance of achieving a higher level of IT-business alignment maturity. Luftman's Strategic Alignment Maturity (SAM) assessment combines six different organizational components (communications, value measurement, governance, partnership, technology scope, and skills) into a strategic alignment maturity score. The purpose of this paper is to summarize recent research that demonstrates the relationship of SAM and firm performance and the results of new research applying a structural equation modeling (SEM) analysis.

## Keywords

Strategic Alignment; Maturity; Validation; Performance, Structural Equation Model

## INTRODUCTION

For almost three decades, practitioners, academics, consultants, and research organizations have identified attaining alignment between Information Technology (IT) and business organizations as a pervasive and persistent problem. IT business alignment researchers have proposed various models and methodologies (Hu and Huang, 2005; Marchand, Kettinger and Rollins, 2001; Bergeron, Raymond and Rivard, 2001; Maes, Rijsenbrij, Truijens and Gondola, 2000; Reich and Benbasat, 1996, 2000; Tallon and Kraemer, 1998; Teo and King, 1996, 1997; Luftman, Lewis and Oldach, 1993; Henderson and Venkatraman, 1993) to help address this conundrum. These approaches have provided limited quantitative validity. Additionally, demonstrating the relationship of IT business alignment to business performance is fundamental in demonstrating the importance of ensuring IT business harmony. Several recent researchers have attempted to improve the understanding of IT alignment factor performance impacts. Among these are Byrd et al. (2006); Chan, Sabherwal, and Thatcher (2006), Sabherwal and Chan (2001), and Chan, Huff, Barclay and Copeland (1997). One metric that appears receptive to researchers and practitioners is Luftman's (2000) Strategic Alignment Maturity (SAM) model. SAM combines six different organizational components (communication, value measurement, governance, partnership, technology scope, and skills) into a strategic alignment maturity score.

The lead author's maturity alignment repository currently consists of 1,960 respondents from 231 Global 1,000 companies' from the USA (138), Europe (16), Latin America (38), and India (39). This paper presents the conceptual SAM model (Luftman, 2000) and its relationship to performance.

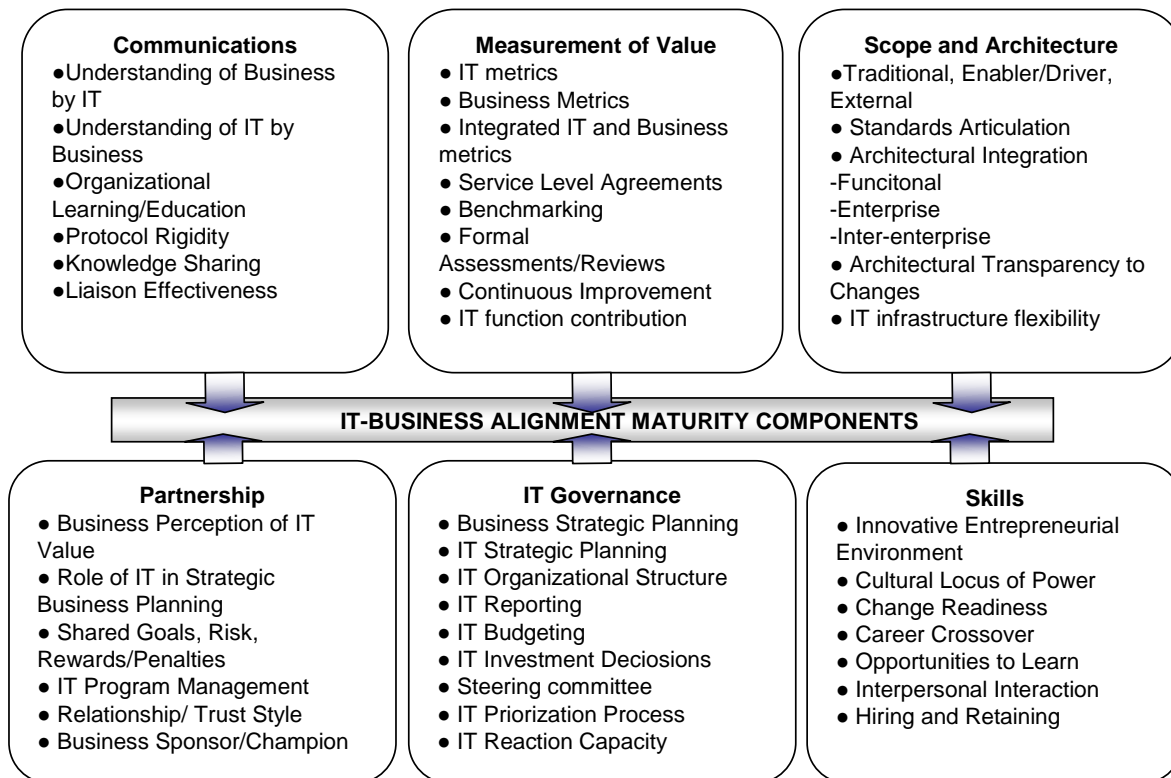
## STRATEGIC ALIGNMENT MATURITY MODEL

The global importance of alignment has remained on the top of information technology surveys for almost three decades. The lead author has previously presented some of the reasons why alignment persists, including: 1. Just focusing on how IT is aligned with the business, and not also leveraging how the business can be in harmony with IT. 2. The continuous pursuit of a silver bullet (not recognizing that there is no one factor that will improve the IT business relationship). 3. The lack of having an effective descriptive and prescriptive tool (until SAM, the Strategic Alignment Maturity assessment) that will assist IT and business executives in dealing with the alignment conundrum. 4. Discussing the importance of alignment but concentrating just on IT infrastructure considerations.

Alignment addresses both how IT is aligned with the business and how business should or could be aligned with IT. Terms such as harmony, link, fuse, fit, match, meld, converge, and integrate are frequently used synonymously with the term alignment (perhaps another reason why alignment has been so evasive). Whatever term you prefer, it is a persistent/pervasive problem that demands an ongoing process to ensure that IT and business strategies adapt effectively and efficiently together.

The Luftman (2000) Strategic Alignment Maturity (SAM) model examined in this article consists of 41 factors (business practices) aggregated in the six components of communications, value measurement, technology scope, partnership, governance, and skills as displayed in Figure 1. Participants rated their organization's behavior in each of these areas using a one to five Likert scale, where "1" denoted very ineffective and "5" denoted very effective.

Other strategic alignment models (e.g., Hu and Huang, 2005; Marchand, Kettinger and Rollins, 2001; Bergeron, Raymond and Rivard, 2001; Maes, Rijsenbrij, Truijens and Gondola, 2000; Reich and Benbasat, 1996, 2000; Tallon and Kraemer, 1998; Teo and King, 1996, 1997; Henderson and Venkatraman, 1993), except for Marchand, Kettinger and Rollins (2001), are essentially descriptive, making them very difficult to be applied by practitioners and consultants. The main contribution of SAM is that it combines descriptive and prescriptive aspects of alignment. This unique combination generates a roadmap that practitioners and consultants can follow to attain higher levels of IT effectiveness which in turn can attain greater business performance.



**Figure 1. Strategic Alignment Maturity model (6 components, 41 factors)**

The following is a brief description of the six maturity components with their relative Strategic Alignment (Maturity (SAM) scores, as seen in Figure 2.

**Communication.** The communication component measures the effectiveness of the exchange of ideas, knowledge, and information between IT and business organizations that enable both to clearly understand the respective strategies, plans, business and IT environments, risks, priorities, and how to achieve them. How well do IT and business executives understand each other? Do they connect easily and frequently? Too often there is little business awareness on the part of IT or little IT appreciation on the part of the business. The overall average maturity score for Communications is 3.10, placing it fourth among the six SAM components. Given the dynamic business and technical environments that continuously confront organizations, knowledge sharing is paramount. Executives must have an appropriate understanding of how business can leverage IT. This understanding is very important as organizations grow and the need for integration across the enterprise and its external partner's increases.

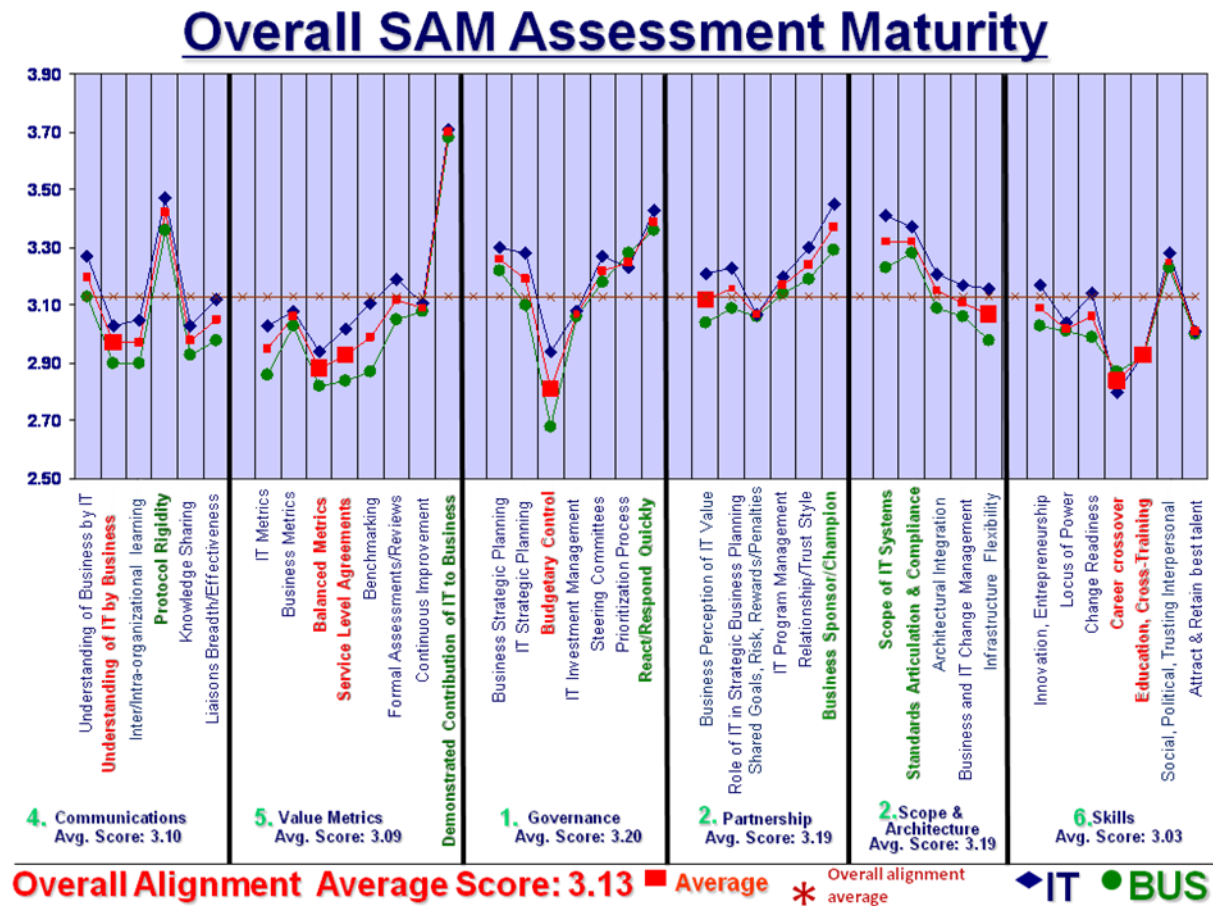
**Measurement of Value.** Measurement of value refers to the use of metrics to demonstrate the contributions of information technology and the IT organization to the business in terms that both the business and IT understand and accept. How well does your organization measure its own performance and the value of its projects? After projects are completed, do you evaluate what went right and what went wrong? Do you improve your internal processes so that next project will be better? Many IT organizations cannot demonstrate their value to the business in terms that the business understands. What is needed is a balanced "dashboard" that clearly demonstrates the value of IT in terms of contribution to the business. Maturity assessments have ranked this component as next to last among the SAM components with the average maturity score of 3.09. In assessing metrics and processes used to evaluate IT's contribution to business both IT and business executives agree that they should use formal vehicles such as return on investment (ROI) and activity based costing (ABC).

**IT Governance.** The IT governance component defines the authority for IT decisions and the processes IT and business manager's use at strategic, tactical, and operational levels for setting IT priorities and allocating IT resources. Governance maturity deals with how well the company connects its business strategy to IT priorities, technical planning, managing risk, and budgeting. IT governance is about who makes the decisions (power), why they make them (alignment) and how they make them (decision process; e.g., portfolio management). Overall maturity assessments have identified governance in first place with an average maturity score of 3.20.

**Partnership.** Partnership gauges the relationship between business and IT organizations, including IT's role in defining the business's strategies, the degree of trust between the two organizations, and how each perceives the other's contribution. It is not good enough to just have excellent IT strategies and implementation plans on paper. CIO's must convince business executives of the corporate value of their strategies. CIO's should be technology-knowledgeable business leaders, thereby improving the relationships with other executives in their organization. Having power and effectively exercising influence are preconditions for accomplishing tasks in organizations. Overall maturity assessments have identified Partnership maturity as tied for second place with technology scope and architecture maturity, with an average maturity score of 3.19. IT is perceived by the business as a fundamental enabler of future business activity as opposed to being considered a driver.

**Technology Scope and Architecture.** The scope and architecture component measures IT's provision of a flexible infrastructure, its evaluation and application of emerging technologies, its ability to enable or drive business process changes, and its delivery of valuable customized solutions to internal business units and external customers or partners. Scope and architecture is the only technical criterion included in the alignment maturity assessment. To what extent has IT evolved to become more than just business support? How has IT helped the business to grow, compete, and profit? Overall maturity assessments have identified technology scope and architecture maturity tied in second place with partnership maturity, with an average maturity score of 3.19. IT systems are primarily business process enablers and IT standards are defined and enforced at the functional unit level with emerging coordination across functional business units.

**Skills.** Skills measures human resources practices, such as hiring, retention, training, performance feedback, innovation encouragement, career opportunities, and individual skill development within IT. It also measures the organization's readiness for change, learning capability, and ability to leverage new ideas. Does the staff have the skills to be effective? How well does IT staff understand business drivers and speak the business language? How well does business staff understand the relevant IT concepts? Overall maturity assessments have identified skills as the weakest (in last place) among the six components, with an average maturity score of 3.03 Entrepreneurship is strongly encouraged but only at the functional unit level.



**Figure 2. SAM Assessment Summary**

As illustrated in Figure 2, the overall average SAM score for the 231 Global 1,000 companies’ is 3.13. Although IT executives tend to assess alignment maturity a little higher than business executives, their relative scores are very consistent. Most companies are still assessed in level 2 or level 3; hence there are still opportunities to improve. The lowest six factors are identified in red; the highest six factors are identified in green.

Since SAM focuses on the degree of strategic alignment practices it might appear to be more operational than strategic. However, most of the practices in SAM focus on the strategic elements driving and enabling strategic alignment between business and IT. Examples of these practices include: the role of IT in business strategic planning; ensuring effective business sponsor and champion(s) for all IT initiatives, IT and business working together to develop strategic initiatives; IT understanding the business and business understanding IT; and recognizing the impact that IT initiatives have on the success of the company. These strategic practices ensure a better understanding and commitment by top management, especially when combined with an effective governance process at strategic, tactical, and operational levels of the organization.

### BUSINESS PERFORMANCE

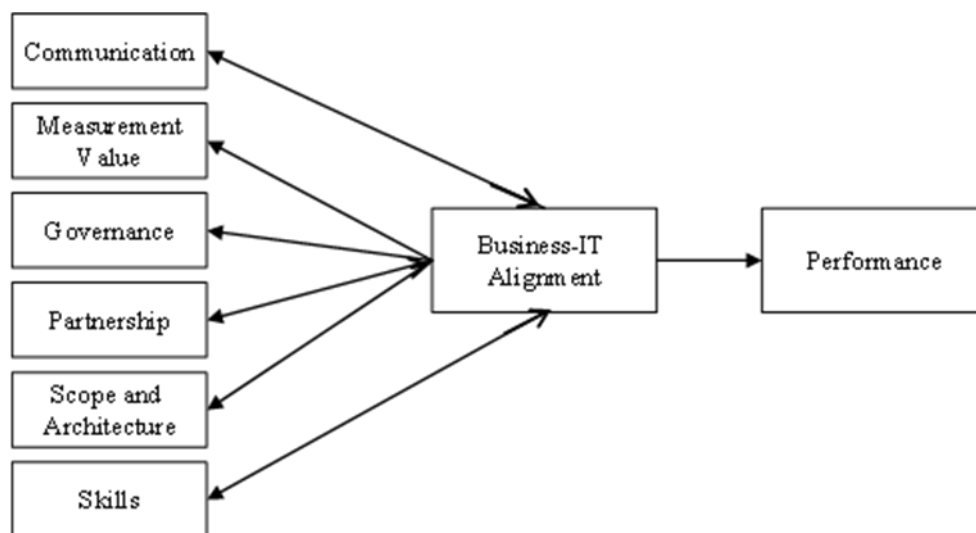
The concept of performance underlies a lot of the research in strategic management and information science. A search in the IT literature revealed several business performance measures. Performance measures include meeting specific goals (Chan et al., 1997), maintaining specific operating ratios (Bender, 1986), achieving profitability targets (Hitt and Brynjolfsson, 1996), and maintaining long term viability as an enterprise (Bergeron, Raymond, and Rivard, 2004). According to Palmer and Markus (2000) prevailing work in IT has concentrated on the use of industry-specific, short-term quantitative measures of performance. Palmer and Markus indicate that these short-term measures include: IT expense to total operating expense, total operating expense to premium income, pre-tax return on assets, return on net worth, pre-tax profits as a percentage of sales, IT expense as percentage of total assets, average five years sales growth, product and process IT, IT expense to premium income, output, labor, ROE, ROS, ROA, profitability as operating profit/operating revenue, sales growth, earnings growth,

management productivity, percentage of net income to total assets, IT expense as percentage of total assets, and percent of labor change.

According to Venkatraman and Ramanujam (1986), different stakeholders such as, employees, customers, vendors, and shareholders employ different measurements of performance. In the strategic business literature, multiple performance measures have been advocated. Venkatraman and Ramanujam stated that there are two main measurements of business performance: financial performance, to reflect the fulfillment of economic goals of the firm, examining indicators such as sales growth, profitability (reflected by ratios such as return of investment, return on sales, and return on equity), earnings per share, and operational performance (i.e. non-financial).

The authors of this paper advocate that a broader conceptualization of business performance would include emphasis on indicators of operational performance in addition to indicators of financial performance. Under this conceptualization it would be logical to treat measurements such as market-share, new product introduction, product quality, marketing effectiveness, manufacturing value-added, and other measurements of technological efficiency within the domain of business performance.

Another issue investigated concerns the data source. The sources of the respective performance data include primary sources; for example, data collected directly from organizations, or secondary sources such as data from publicly available records. The performance measures used in this paper include secondary sources from public records. The performance data applied in this paper focuses on Return on Assets (ROA), Return on Equity (ROE), and Return on Investments (ROI). The choice for ROA, ROE, and ROI as performance indicators was made because these measurements that assess firm performance are size independent. Also, Dorociak (2007) established a significant positive correlation between Chan's (1992) strategy variables and ROE. Thus we believed that the ratios delivered size independent strategy performance figures. Figure 3 illustrates the overarching model of the objective of the authors research to demonstrate the relationship of SAM to firm performance.



**Figure 3. Proposed Performance Model**

### RESEARCH ON SAM IMPACT ON COMPANY PERFORMANCE

Previous SAM investigations (summarized below) by the same research team working with Luftman include the banking industry (Dorociak, 2007), small industry (Rigoni, 2006), pharmaceutical industry (Nash, 2005), government (Sledgianowski, 2004), international chemical manufacturers (Sledgianowski and Luftman, 2005) and IT services (Kempaiah, 2008).

Nash, employing the results of 145 business and IT executives from 9 pharmaceutical companies, demonstrated a positive correlation between strategic alignment maturity and higher levels of firm-level sales, higher levels of firm-level productivity and profitability (Total Factor Productivity, Net Profit Margin, Return on Equity, and Enterprise Value/Sales). Nash's study provided empirical evidence for the use of Luftman's strategic alignment maturity model as an appropriate tool for assessing the maturity of IT-business alignment in the pharmaceutical industry.

Dorociak, employing the results from 27 banking industry companies, found that the alignment between banking industry's IT and business strategies positively affected business performance. The banking industry displayed a significant positive

correlation between performance and alignment supporting his conclusion that performance and maturity generally increases together.

Sledgianowski and Luftman's SAM study of a large chemical manufacturing company demonstrated that identifying and implementing the best practices of IT and business alignment, organizational efficiency was increased by streamlining and simplifying business processes worldwide. By knowing the maturity of the organizations practices, strategic choices, and alignment relationship, they were able to determine specific opportunities for improvement. SAM provided management with a tool to assess their maturity and then to improve it by implementing specific best practices.

Kempaiah's study employing the results of 90 executives from 14 Indian IT service companies demonstrated a positive correlation between strategic alignment maturity and organizational performance measurements such as ROI, ROA, and NPM. This research was extended to include 5 U.S. service firms and the correlation of SAM to firm performance was again demonstrated (.826).

Regardless of culture, geographic location, or industry, higher firm performance has repeatedly been demonstrated to accompany higher alignment maturity. This is further validated by the strong correlation (.55) between SAM and firm Return on Assets (ROA) and Return on Investment (ROI) performance for the 138 organizations in the SAM repository where this data was available.

Each of the studies substantiated that higher SAM maturity corresponded to increased organizational performance. That increased organizational performance raises the businesses' bottom line. To IT and business executives this means that the firm should be actively pursuing activities with the goal of increasing alignment. The cost benefit of SAM alignment seems highly favorable. The results of our Structural Equation Modelling further demonstrates the contriutuin of SAM.

## **DISCUSSION OF Structural Equation Modeling (SEM) ANALYSIS**

### **METHODOLOGY (SURVEY DESIGN, MEASURES AND ANALYSIS)**

The Strategic Alignment Maturity data used for this investigation consists of 385 responses from 138 (Global 1,000) companies (126 companies from the United States and 12 IT services companies from India). The data arises from SAM assessment participation by business and IT executives from Financial (54), Manufacturing (16), Pharmaceutical (10), Insurance (7), Services (7), Hotel (5), Retail (5), Chemicals (4), Government (4), Healthcare (4), Transportation (3), Consulting (2), Education (2), Utility (2), Entertainment (1), and Indian IT service firms (12). Some of the companies from the overall SAM repository (231 companies) are still under review to obtain ROA, ROE and other performance data.

To be conclusive the analysis should result in a Z statistic of at least 1.96 and support a 95% confidence interval (Dillman, 2000). Our SPSS Amos Critical Values tables established that the Z statistic in the executed model met these criteria. Kline (2005) presents additional sample size guidelines for SEM modeling. According to Kline, a small sample consists of < 100; a medium sample contains between 100 and 200; and a large sample is comprised of > 200. Kline further relates that sample size affects the ability of the model to portray complex relationships and that more complex models require larger samples. Thus a size of 200 or even much larger may be necessary to accurately portray a very complicated path model. A desirable goal is to have the ratio of the number of cases to the number of free parameters be 20:1; a 10:1 ratio, however, may be a more realistic target (Kline, 2005). Hence, a path model with 20 parameters should have a minimum sample size of 200 cases. If the cases/parameter ratio is less than 5:1, the statistical precision of the results may be doubtful (Kline, 2005). Our model's 14 measured variables required a large sample size and approximated Kline's criteria.

### **Data Analysis**

SEM requires assumptions of multivariate and univariate normality and allowances for a process to handle missing data. The pre-model data screening established these parameters (Kline, 2005). The model for this paper used maximum likelihood estimations, because Kline stated that maximum likelihood-based methods for incomplete data generally outperformed traditional available case methods. The missing data allowances and satisfactory data normality tests prior to model execution substantiate that this research's proposed model meets Kline's criteria. According to Koufteros (1999) an adequate measurement model should be constructed prior to testing a substantive theory. However, Byrne (2001) indicates that theory precedes the measurement model. We agree with Byrne. Our model revealed that the SAM delivered a theoretical model that exhibited a satisfactory level of reliability and validity.



This research used Amos 6.0 software from SPSS to perform maximum likelihood (ML) modeling and provide model goodness of fit characteristics. Thus, although the large sample size potentially induces a reduced Chi Square p-value (Barrett, 2007), goodness-of-fit and the underlying rationale that theory may over-ride model fit discrepancies (Hayduk et al, 2007) justified the results of the ML SEM. Modeling concerns manifest in a reduced Chi Square p-value are compensated for by the ability to perform more complex modeling (MacCallum, Roznowski, Mar and Reith, 1994). The sample contains an N size greater than Kline's (2005) implied 200 sample lower limits and meets the required size parameters.

In an attempt to obtain model validation and generalization, IT researchers have begun using SEM. Although Hayduk, Cummings, Boadu, Pazderka-Robinson and Boulianne (2007) determined that SEM sample sizes as low as 72 provided valid models, they and most other researchers agree that sample sizes greater than 200 are preferred for a valid SEM (Fan, Thompson and Wang, 1999; Barrett, 2007; Mulaik, 2007). Kefi and Kalika (2005) and Chan et al (2006) provide examples of recent IT alignment SEM research. The initial expectation of the authors of this paper was that Luftman's SAM research would provide an adequate sample size because it used data from 385 participants.

Kefi and Kalika's (2005) SEM alignment research consists of a model adapted from Henderson and Venkatraman's (1993) strategic alignment model and supports conclusions that organizational performance benefits from IT alignment in the presence of four conditions. Those conditions include: IT strategy receiving top management support, the business perceiving that IT increases competitive advantage, the presence of a cooperative relationships between the business and its strategic partners that use IT tools and linkages, and having IT supporting intra and inter firm processes. Chan et al's (2006) SEM investigation supplements Chan's (1992) alignment model. Both Kefi and Kalika's, and Chan et al's models are derived from Henderson and Venkatraman's alignment model. Chan et al's SEM model determined relationships between shared domain knowledge, planning sophistication, prior IT success, organizational size, and environmental uncertainty. Chan et al determined that the company's business sector should be taken into account while linking antecedents (like size) to alignment, and consequently alignment to performance. For example, organizational size positively affected alignment in private sector firms but not in academic institutions.

The results of Kefi and Kalika (2005) and Chan et al (2006) suggest that the observed effects of aligning business and IT, even if based on an identical conceptual model, may depend on the measured variables and the business sectors. This paper extends the alignment analysis focus by including maturity, increasing the set of variables, and applying it to additional business sectors because a SEM based on the Luftman (2000) Strategic Alignment Maturity model uses a maturity model to assess more variables (41 factors for Luftman's SAM) than those contained in Chan et al (2006) and Kefi and Kalika (2005).

A SEM supported SAM model that explains the performance impact of IT business alignment produces a major contribution to the literature. Our objective is to present a generalizable model that validates Luftman's SAMs impact to organizational performance. With regards to previous SAM studies, this is the first paper that achieves construct and discriminant validity, thus ensuring the credible use of SAM as an accurate measure of business IT strategic alignment.

A Factor analysis of the construct (component) variables partnership, communication, governance, value, skills, and technology scope revealed that the KMO or validity of each construct was acceptable. KMO's for the constructs calculated to be between .71 and .85. Cronbach's alpha reliability figures for each database construct exceeded .80. Hence we concluded that the model exhibited reliability and validity. Construct validity, which addresses whether the scores measure the hypothetical construct the researcher believes they do for the following reasons. Hypothetical constructs are not directly observable and thus can be measured only indirectly through observed scores. There is no single, definitive test of construct validity, nor is it typically established in a single study. The SEM method of confirmatory analysis is a valuable tool for evaluating construct validity (Kline, 2005).

Other vehicles pursued in this research, including convergent validity and discriminant validity, involve the evaluation of measures against each other instead of against an external criterion. A set of variables presumed to measure the same construct shows convergent validity if their correlations are at least moderate in magnitude. In contrast, a set of variables presumed to measure different constructs shows discriminant validity if their intercorrelations are not too high. For example, if the intercorrelation of X and Y is .90 then we can hardly say that variables X and Y measure different constructs. The evaluation of convergent validity and discriminant validity is a common part of confirmatory factor analysis. External validity examines whether or not an observed causal relationship should be generalized to and across different measures, persons, settings, and times. It is necessary to cite which degree of generalizability was attained in relation to construct, convergent, discriminant and external validity.

## Discussion of Results

The six Luftman Strategic Alignment Maturity constructs: partnership, communication, governance, value, skills, and technology scope define alignment maturity. Alignment maturity directly impacted company performance. Performance measures consisted of ROA and ROI were obtained from public records for each organization. The maximum likelihood model was recursive and adequately defined. Thus we conclude that it is admissible.

As elaborated on in the appendix, our final model derived from less than optimum antecedents. The derivation suggested that the model potentially contained too many variables in relation to the amount of data, that factors should be combined, or that unaccounted sub-factors may have adversely affected fit. We observe that the variable count was already at minimum for Amos processing and that further reduction could eliminate SAM components. However, as a reliability and validity check we performed a Cronbach's alpha and traditional factor analysis of the SAM components associated with the final model. The Cronbach's alpha of .967 was excellent. The validity or KMO value of .902 was outstanding. The FA's component matrix was univariate with values ranging between .823 and .894. According to a traditional analysis the questions from which the SEM was derived were very reliable, very valid, and strongly related without concern for additional sub-factors. In other words, the relationship of SAM to organizational performance (using the identical variables as the SEM) appears very strong. The strength of traditional analysis suggests that relationships demonstrated by a SEM that used those variables deserve consideration. Based on the traditional analysis it appeared reasonable to continue with the SAM SEM Path.

Amos statistical interpolations were used for any missing variables. All regression coefficients between the measured variables and the construct to alignment maturity exceeded .3. As observed in the model drawing Figure 4, the construct coefficients ranged between .83 and .89. These relationships were tested by a one-to-one comparison to find the path with the highest covariances. The defined path represents the strongest relationships between each of the SAM constructs. Thus all regression coefficients were maximized and their values are significant. As indicated by the path diagram the SAM components demonstrate mutual support. We believe that the mutual support between SAM components contributes towards its effectiveness and validity.

The determination that all covariance estimates were  $> 0$ , none of the standard errors approached 0, and all critical ratios exceeded 1.96 (indicating that the model Z statistic is significantly different from 0), support a conclusion that the model is feasible. The relationship of alignment maturity as defined connecting Competency and Performance presents a positive correlation of .55. This means that 55% of the performance construct variance is explained by the alignment maturity variance (expressed as the Competency variable). Because a 10% construct variance contribution is generally considered significant, the SAM demonstrates a greater than significant relationship to performance. In other words, higher levels of alignment maturity are definitely associated with higher levels of performance. The .55 correlation between alignment maturity and performance supports the conclusion that alignment maturity significantly contributes to performance.

The model's 14 measured variables resulted in 71 degrees of freedom. The consistently low Hoetler values suggested that to obtain unequivocal validity and generalizability the model likely requires the nominal 200 companies. Also, because the Chi Square of 152 possessed a p value of 0.000, model fit was assessed by goodness of fit characteristics (Fan et al, 1999; Byrne, 2001).

The normal fit index (NFI) was .894, relative fit index (RFI) .844, increment fit index (IFI) .941, and the comparative fit index (CFI) .939. Although the NFI is close to Bentler's (1992) original proposition that .90 reflected a well fitting model, it is significantly less than the latest recommended .95 (Hu and Bentler, 1999). The .939 CFI exceeds the .90 index of choice, (Bentler, 1990). The magnitude of CFI suggests that the model possess an adequate fit.

The parsimony indices, parsimony comparative fit index (PCFI) of .635, and parsimony normal fit index (PNFI) of .605 fall within the normal range and support that the model meets parsimony requirements. The results represent a good degree of precision and support a conclusion that the hypothesized model fits within acceptable bounds. The root mean square error of approximation (RMSEA) of .099 exceeds the suggested .06 (Hu and Bentler, 1999), and is greater than the generally acceptable .08 (MacCallum, Browne and Sugawara, 1996), but falls within the model's 90% confidence interval. The RMSEA possibly also reflects the low data to variable ratio. The Hoetler score associated our findings (.05 Hoetler 71, and .79 Hoetler 224) confirm the previous low data quantity. Thus, the Hoetler values appear to agree with MacCallum and Austin's (2000) suggestion that more complex models require larger data sizes. However, we note that this research remains preliminary and will continue with additional data. We also note the strong validity obtained from the traditional FA validity supports the SEM findings that validity supports the SEM findings.

Therefore, we concluded that the model using 14 of the 41 SAM components appears to suggest a valid SEM. We note that the SEM indices are relatively poorly supported and that additional data must be included. However, we suggest that the relationships displayed from the CFA through the path diagram appear justified and reasonable. As additional performance data becomes available, as well as new SAM assessments performed, this research will continue.

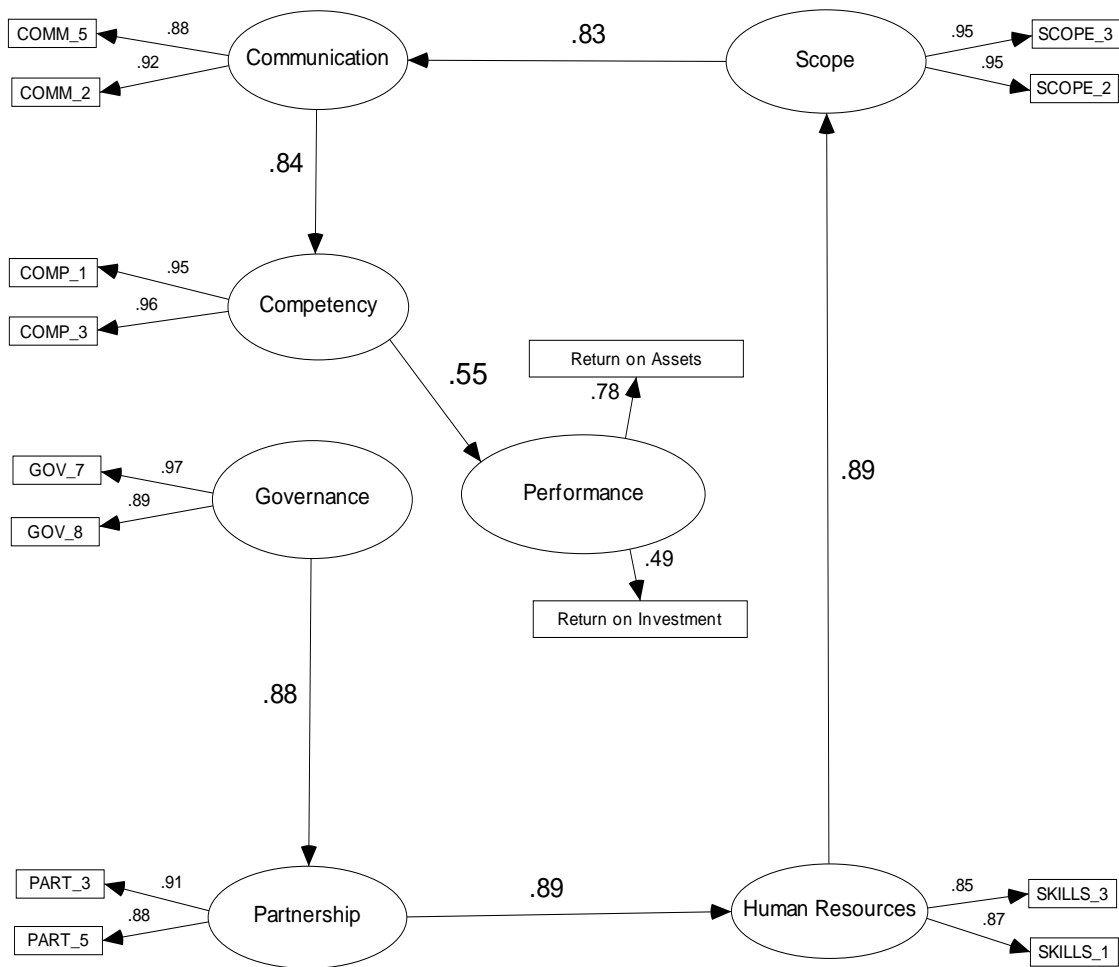


Figure 4. SAM SEM Path Model

### **SEM Research Limitations and Suggestions for Future Research**

The data for this research seems appropriate in a valid SEM model. We believe it reasonable that additional responses and performance variables would increase model accuracy or refine the design. For example, additional data could allow random data groupings to test for possible sub-factors. We suggest substantiation of this model by conducting additional research using a larger database and other databases, possibly with additional performance measures. We emphasize that this model represents preliminary and continuing research. We recognize that this study appears inconclusive concerning SEM goodness of fit and refer the researcher to the traditional analysis findings included in the discussion. This preliminary investigation provides research opportunities for comparative analyses between the results obtained or obtainable from additional data. The most significant suggestion for additional research is to obtain additional data sufficient for a generalizable strongly supported goodness of fit. The component reduction and path modeling provided an increased understanding of the uniqueness of SEM modeling.

### **Conclusions**

With most organizations obtaining SAM level 2 and level 3 scores, there are still significant opportunities to improve IT business alignment. It is time to stop debating what we call it. It is time to recognize that there is no silver bullet for addressing the conundrum. It is time to enhance and apply existing tools (and the lessons learned from their application) to help organizations improve performance by leveraging IT.

This research provides a landmark investigation concerning Luftman's SAM. Although previous studies demonstrated the relationship of SAM to firm performance, this is the first study that provides SEM statistical substantiation of the relationship between SAM and business performance (covariance of .55). The SEM showed statistical significance, giving empirical support to a previously established theoretical background.

In addition to introducing the SEM to SAM analysis, this study of a subset of the SAM repository also reveals that valid SAM assessments may be conducted using a reduced question sets. The benefits of question reduction should prove beneficial to scholars and practitioners. Among those benefits are faster analyses, less prone to error, and easier explanation of variable interactions. Of particular value was the SEM path determination that depicts mutual support for SAM components. That support is significant because it explains the reason that the SAM provides such a reliable performance determinant.

Establishing the SEM path also allows scholars and practitioners insight into the SAM component interactions. In other words, practitioners may, with increased assurance, decide the most opportune correction points for SAM determined weaknesses. For example, a consultant may now assist a client in deciding where to intervene to improve strategic alignment and the relative affect on subsequent stages. This enhances the application of SAM as a prescriptive tool.

To scholars this study adds more evidence concerning SAMs impact on business performance. To IT and business practitioners and consultants this SAM validation delivers empirical evidence for using the SAM model as an instrument to better leverage IT.

Dr. Luftman welcomes additional contributors interested in adding to the growing repository of SAM research data.

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Appendix: SEM Model Development

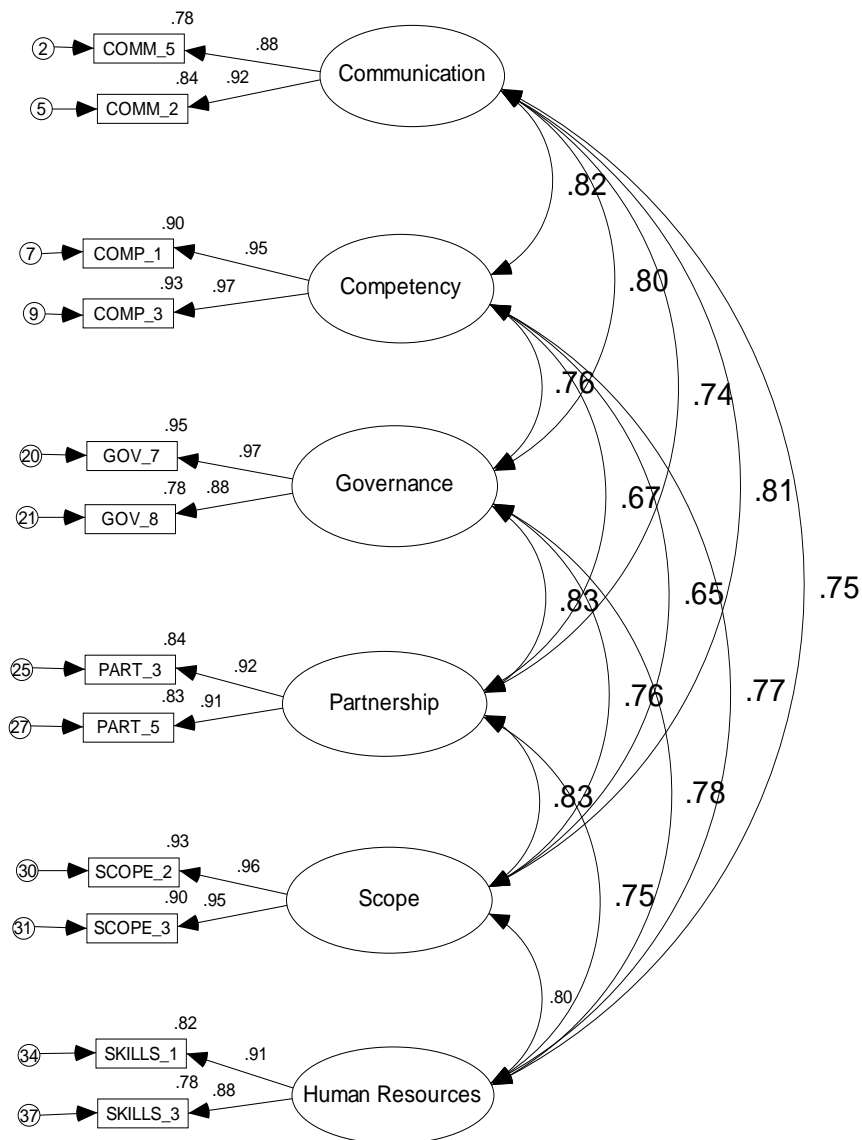


Figure 5. CFA model

The CFA model (Figure 5) exhibited 39 degrees of freedom and seemed a good candidate for a fair fit. For example, it possessed a CFI of .981 and IFI of .962, but an RFI of .908. The RFI was slightly low. The RMSEA of .074 was within the acceptable range. The parsimony measures PNFI of .477 and PCFI of .490 were also acceptable. However, the Hoetler .05 and Hoetler .01 of 101 and 115 respectively supported a conclusion that the the amount of data available was insufficient for the model's accuracy. Since the number of exogenous SAM questions, treated as variables had already been reduced to the minimum supportable in an Amos model, it was decided to use the CFA elements as the components for the remaining models. However, we used the CFA components with the understanding that low data quantity would probably manifest itself. It was anticipated that the low data quantity would likely negatively affect the model accuracy. That proved the case.



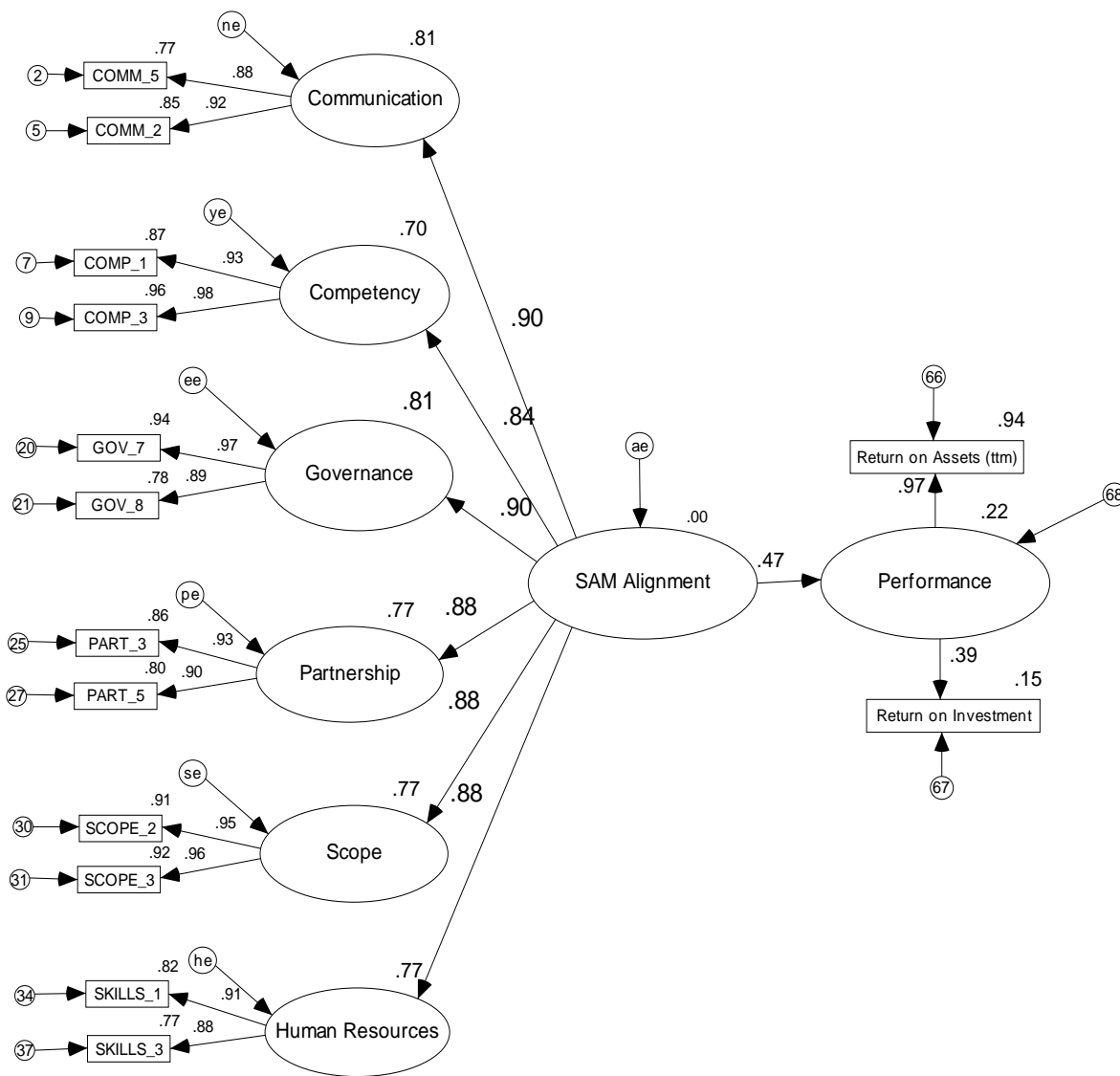


Figure 6. Reflexive Model

The CFA was developed into a reflexive model (Figure 6) in which the SAM appeared to demonstrate a positive and significant affect on organizational performance. The reflexive model demonstrated that the artifact, SAM alignment, distributed over the six SAM components of communication, competency, governance, partnership, scope, and human relations skills. The correlation of .47 between SAM alignment and performance is significant and supports a conclusion that the SAM positively affects performance. The regressions for the various SAM components appear significant also. The significant regressions for the SAM components support a conclusion that the components contribute to the SAM measure. However although this model demonstrated a CFI of .961, it began to display the effects of the low data count. For instance, the RFI declined to .873. The parsimony ratios still seemed within reason oat PNFI .610 and PCFI of .641. The RMSEA, or variable of choice was still an acceptable .080. However, the data quantity limit indicators, the Hoetler’s fell to 87 and 97. As a result of the declined goodness of fit, particularly the Hoetler data quantity sufficiency indicators, this model appears less strongly supported than the CFA. In other words, the data quantity may have begun manifesting itself in a reduced fitting model. We could not claim that this model was good.

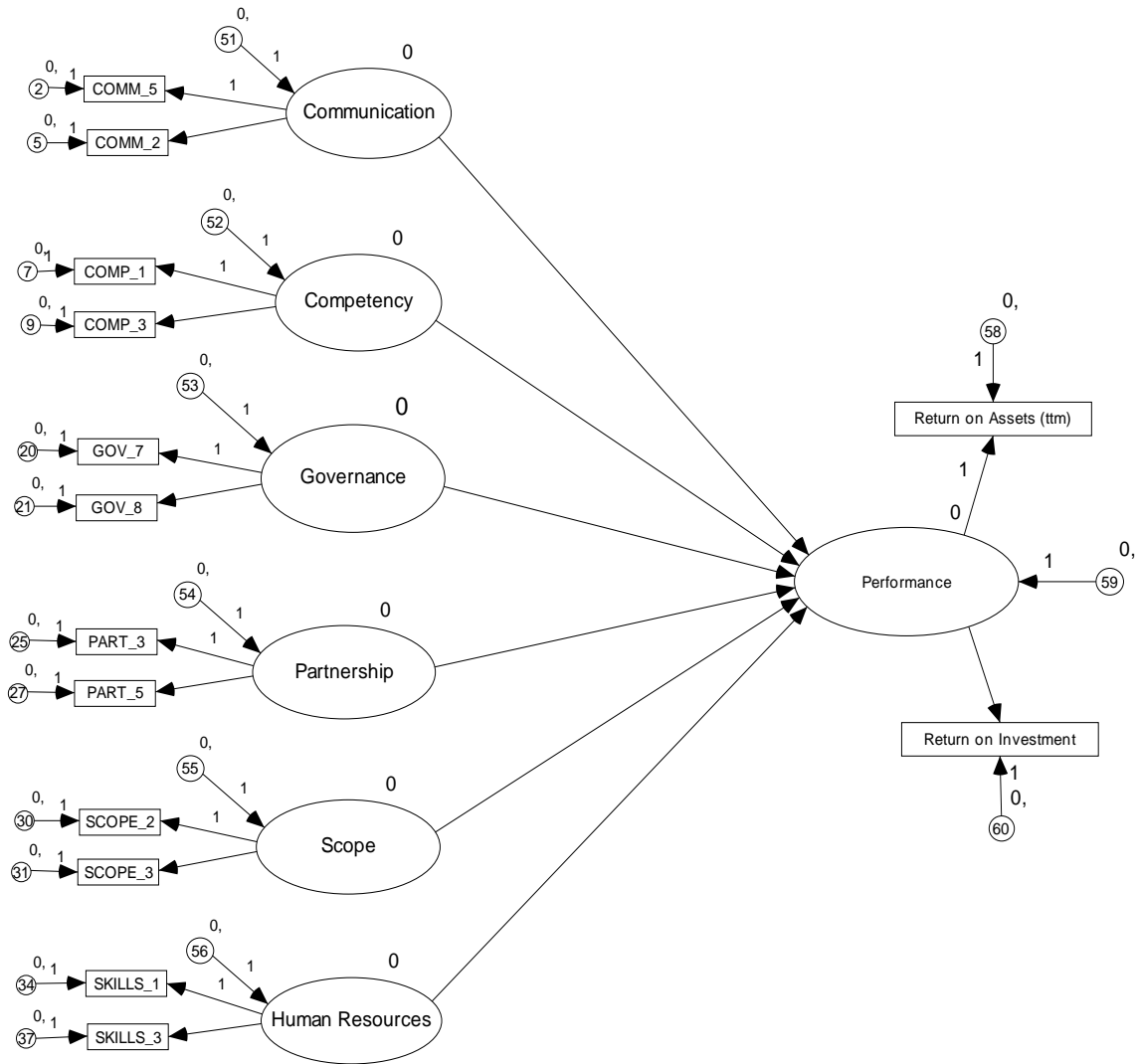


Figure 7. Attempted SEM Path

Originally we tried a SEM similar to that displayed in Figure 3. However, the survey data only contained one variable that directly measured the SAM maturity. That variable consisted of a calculation derived from the entire survey responses per company. The absence of a second SAM determining variable precluded designing a SEM constructed according to Figure 3. Therefore, we attempted the design illustrated in Figure 7. Unfortunately the design in Figure 7 possessed negative variances for three residuals. The negative variances were associated with Governance, Partnership, and Performance. As a result of the negative variances the model displayed in Figure 7 was considered inadmissible and we began redesigning. That redesign consisted of examining the theoretical linkages between SAM components and the covariances between them. Maximizing the covariances approximated the likely theoretical path and resulted in the redesigned SAM SEM as depicted in Figure 4. We were aware from the findings associated with the CFA that the quantity of data seemed low but chose to continue in order to demonstrate that the six SAM components, as already established during traditional FA studies, appeared feasible in a SEM analysis.