

2008

Maturity Matters: Performance Determinants of the Procurement Business Function

Ronald Batenburg

Utrecht University, r.s.batenburg@cs.uu.nl

Johan Versendaal

Utrecht University, jversend@cs.uu.nl

Follow this and additional works at: <http://aisel.aisnet.org/ecis2008>

Recommended Citation

Batenburg, Ronald and Versendaal, Johan, "Maturity Matters: Performance Determinants of the Procurement Business Function" (2008). *ECIS 2008 Proceedings*. 144.

<http://aisel.aisnet.org/ecis2008/144>

This material is brought to you by the European Conference on Information Systems (ECIS) at AIS Electronic Library (AISeL). It has been accepted for inclusion in ECIS 2008 Proceedings by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact elibrary@aisnet.org.

MATURITY MATTERS: PERFORMANCE DETERMINANTS OF THE PROCUREMENT BUSINESS FUNCTION

Batenburg, Ronald, Institute of Information and Computing Science, Utrecht University,
Padualaan 14, Utrecht, The Netherlands, r.s.batenburg@cs.uu.nl

Versendaal, Johan, Institute of Information and Computing Science, Utrecht University,
Padualaan 14, Utrecht, The Netherlands, jversend@cs.uu.nl

Abstract

The procurement business function is increasingly recognized as strategic and subject of performance management. In this paper we present a research model to decompose the procurement function by six maturity dimensions (strategy, e-technology, process, information, monitoring and organization). The model is based on the proposition that an organizations' procurement performance is positively related to its procurement maturity. In addition, we hypothesize that the alignment between the different procurement maturity dimensions positively effects the maturity-performance relation. A survey was conducted among 117 Dutch organizations from various industries and size categories, to apply the research model and test the hypothesis. From regression analysis we found significant positive, and stable net effects of procurement maturity on procurement performance. Alignment did not effect the shape of the maturity-performance relationship, but (by one type of measurement) it does increases the strength of the relationship. We conclude that our research model supports procurement maturity assessment and benchmarking for organizations, to improve their procurement business function in an integrative way.

Keywords: procurement, maturity, alignment, performance, benchmarking.

1 INTRODUCTION

Kraljic (1983), Speckman (1981), Porter (1985), Malone and Yates and Benjamin (1987), and other scholars already identified the strategic importance of procurement in the 1980's. Many companies, however, have unnoted the competitive value of the procurement business function. The primary interests of managers concerned the internal processes, sales and marketing. Since the rise of e-business in the late 1990's, new opportunities related to procurement arose: e-procurement, spend management, outsourcing, joint product design, and more (Lacione & Smith & Oliva 2000). Although the opportunities for improvement seem abound, both private and public sector are still cautious as for far as the adoption of electronic technologies is concerned (Zheng & Caldwell & Harland & Powell & Woerndl & Xu 2004). Ward and Peppard (2003) indicate that 60% of IS/IT application implementations do not deliver the expected benefits, and anecdotal evidence shows that procurement initiatives in general – and IT-implementations in the procurement domain specifically – are no exception (cf. Adamson 2001, Pan & Parkes, 2006, Puschman & Alt 2005, Davila & Gupa & Palmer 2002). As the number and diversity of procurement frameworks, models, perspectives and concepts continues to grow, the need to combine or integrate these increases likewise. In addition, the demand grows for their empirical validation, including evaluation of the claims and assumptions of models and approaches to improve procurement in organizations.

In this paper, we attempt to achieve both the practical and academic benefits of integrating existing approaches to procurement improvement and optimization on the one hand, and validating the propositions underlying these approaches through data surveying a substantial number of procurement managers from different organizations on the other. To do so, we present a research model that is built on principles of maturity, business/IT-alignment and performance measurement. Subsequently, we validate its two underlying propositions: (1) the procurement performance of an organization is positively related to the maturity level of its six procurement dimensions (strategy, e-technology,

process, information, control and organization) with respect to procurement, (2) the procurement maturity-performance relationship is positively effected and moderated by the degree of alignment of these six procurement maturity levels.

In the domain of procurement many papers have been published on procurement performance (cf. Bozarth & Handfield & Dasb 1998), yet without an maturity and alignment approach for procurement performance. Beukersm, Versendaal, Batenburg and Brinkkemper (2006) created a maturity/alignment framework for procurement, but with emphasis on one particular case. While Kroese, Den Teuling, Versendaal, Batenburg and Van de Kamp-Slootweg (2008) created a maturity/alignment framework for integrating e-procurement in organizations, and applied it on survey data from 300 Dutch organizations, they did not relate it to procurement performance. With our research we want to extend the work of Beukers et al (2006) and Kroese et al. (2008).

In the remaining of this paper, we first elaborate on the foundations and construction of a procurement maturity/alignment/performance model. Then, a survey that is based on the model is described, with a focus on the validity of the measurement instruments. Next, the data collection by surveying 68 procurement managers from different organizations is explained, i.e. through the practical application of a questionnaire. After testing our central hypothesis through several analyses, we provide suggestions for procurement improvement plans, based on the survey and its outcomes. We close with recommendations and suggestions for further research.

2 THEORY AND RESEARCH MODEL

In the subsections below we discuss and define procurement maturity, procurement alignment and procurement performance as the main pillars of our research model.

2.1 Procurement maturity

The first pillar of our theoretical framework is based on the concept of progress maturity. In general, the idea of maturity is presented by sketching a number of growth stages that depict the potential-upward development or performance of organizations during several sequential periods of time. Within the field of information systems, the Nolan model is often quoted as the origin of the maturity perspective (Nolan 1979). As for information systems planning, Earl's model of learning curves with respect to IT can be considered as one the first examples IT-specific extensions to Nolan's model (Earl 1989). Since then, both the original Nolan and Earl models have been revised, extended, specified and modified, in line with progress made in the field of information systems and software engineering (cf. Galliers & Sutherland 1991). After publication by the Software Engineering Institute (SEI) at Carnegie Mellon, the Capability Maturity Model (CMM) has become an established model in the field of information systems. It is designed to measure, monitor and evaluate the professional development and engineering of software and many related domains such as IT-governance, project management, people management and so on (Peppard & Ward 1999), with the assumption that the higher the level, the more mature and the higher the performance of an organization.

With the idea that the procurement function has the ability to influence corporate profitability favorably, the functional development has been a topic of great interest. Departing from the passive, re-active clerical viewpoint of the 70's, the procurement function has developed in a strategic pro-active function contributing, as much as other business functions, to the creation of (sustainable) competitive advantage. The fact that such a significant advantage can be achieved is described by many authors (e.g. Adamson 1980, Porter 1985, Cavinato 1991, Herberling 1993).

During the last two decades numerous authors proposed, and constructed, development models for corporate procurement. Most of these assume a stage/step-wise development. Van Weele and Rietveld (2000) derived an integrated purchasing development model based on no less than 12 of these models. We consider their 'meta-model' of procurement maturity stages as a solid starting point for further modeling. Their six cumulative stages for procurement maturity are:

- Transactional orientation;
- Commercial orientation;

- Purchasing co-ordination;
- Internal integration;
- External integration;
- Value chain integration.

In our framework we will adopt this Van Weele and Rietveld maturity categorization. In our empirical research however, we will abstract from their distinction between ‘external integration’ and ‘value chain integration’ as we practically experience these stages as ‘Network orientation’ both dealing with integration beyond the firm. It is our proposition that procurement performance is correlated to the level of procurement maturity.

2.2 Procurement alignment

The second pillar of our framework is based on the concept of business/IT-alignment. Since the 1980’s, scholars, analysts and consultants alike have advocated an aligned approach with regard to introduction and deployment of information systems (IT) in organizations. One widely cited source is Porter (2001), who argues that the Internet does not make business strategy obsolete. Instead, an Internet and business strategy should coincide, i.e. be aligned. On an operational level, many authors can be cited for the statement that IT implementations should come along with a careful consideration of business processes and other organizational issues (cf.. Peppard & Ward 1999, Hammer & Champy 1994). Henderson and Venkatraman’s Strategic Alignment Model is one of the first models that provided levers for organizations in introducing new IT technologies using business/IT-alignment concepts (Henderson & Venkatraman 1993). Business strategy, IT strategy, organizational infrastructure and processes, and IT infrastructure and processes should be in balance through strategic fit, and functional integration (see also Luftman & Lewis & Oldach 1993). Subsequently, several authors applied the Strategic Alignment Model. With varying success, the connection between alignment and organizational performance has been investigated (Cragg & King & Hussin 2002, Kearns & Lederer 2000, Peppard & Ward 1999).

If we apply the Strategic Alignment Model to the field of procurement, the business domain of the model clearly can be specified. Procurement is connected to many domains. Cavinato (1999) identified 15 different attributes or viewpoints to track the purchasing business function across developmental maturity stages, such as key procurement measures, management style, and budgetary approach towards procurement. In a similar vein, A.T. Kerney’s house of purchasing and supply management framework identifies eight procurement dimensions (“The New” 2000). In our research, we define the business/procurement domain by building on the alignment model of Turban (Turban & McLean & Wetherbe 1999). Turban et al. distinguishes five basic business dimensions (including IT) that are generic or every organization. In turn, these build upon the classic ‘balanced’ organization models as developed by Leavitt (1965) and Scott-Morton and Allen (1984). Applying these to the procurement domain and extending the (IS/IT) technology dimension, we define as the main business dimensions:

- Goals and strategy
- Control
- Organization
- Process
- Information
- E-Technology

Related research in the functional domain of customer relationship management (Batenburg & Versendaal 2004), and product lifecycle management (Helms & Batenburg & Versendaal), as well as the research of Beukers et al (2006) identifies a comparable drill-down of business/IT dimensions, while the research of Kroese et al (2008) uses identical dimensions. From an organizational performance perspective, we consider each of the dimensions as equal important (i.e. of equal weight). Further, we define the degree of alignment as the degree to which these 6 perspectives are balanced as for their maturity. It is our proposition that a higher degree of alignment positively influences the correlation between procurement maturity and procurement performance.

2.3 Procurement performance

As a specific research goal of this paper is to explore the procurement performance of organizations, we explicitly address procurement performance into our model. Berkowitz and Mohan (1987), Monczka and Trent (1991), Porter (1985), Speckman (1985) and Sutton (1989) identify the following benefits when effectively manage the procurement function: cost reduction, enhanced profitability, assured supplies, quality improvements, and competitive advantage.

The I-Frame (Versendaal & Brinkkemper 2003), a procurement improvement framework, provides no less than twenty different benefits derived from several sources in the procurement and e-business literature. Those benefits can be categorized as follows: process-related (with e.g. the benefit of improved sourcing decisions), cost-related (e.g. reduced purchasing costs), product quality-related (e.g. better product quality), and organization-related (e.g. increased trustworthiness). In an investigation of procurement improvement effectiveness, Accenture (2002) identifies the following four procurement performance indicators: purchase price index, quality conformance, raw material inventory turnover, and supplier delivery accuracy. These indicators can be easily mapped onto the identified benefits in the I-Frame.

For our model we can select from many performance indicators and benefits. In order to have a manageable set we include basic indicators per procurement level: strategic, tactical and operational (De Paoli 1999, Van Weele, 2001, Versendaal and Brinkkemper, 2003). The related research from Accenture, Toole and Donaldson (2002) and Humphreys and Li and Chan (2004) support our selection of the following procurement performance indicators.

- Quality conformance (strategic)
- Price purchase index (strategic and tactical)
- Procure-to-deliver time (operational)
- Transaction costs (operational)

2.4 The research model

The procurement maturity and alignment concepts as described above can be put together as our procurement framework. In combination with the procurement performance as defined above, the following scheme depicts the research model that will steer our empirical analysis in the next sections.

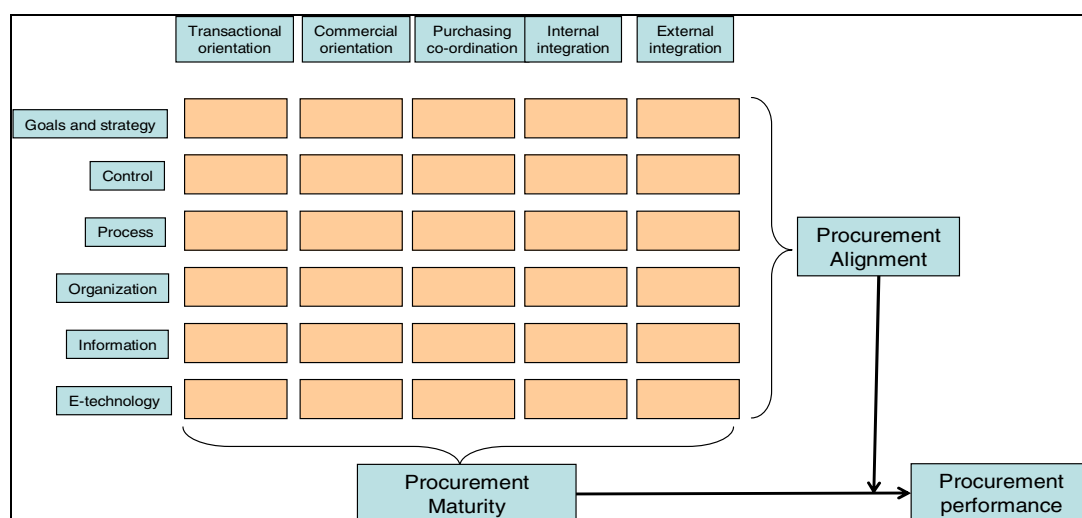


Figure 1. Research and conceptual model

Note that we modelled a direct relationship between procurement maturity and performance, which will be moderated by the degree of alignment. The figure presents our plan of analysis for the next sections. We start with measuring the procurement maturity by the five levels, sketched in the matrix of the figure form left to right. This maturity measurement is applied for the six basic dimensions of the procurement function. The alignment concept implies the balance between the six procurement

domains. The main hypothesis to be tested is that both the maturity of the six procurement functions, and the alignment between these dimensions are positively related the firms' procurement performance as depicted by the two arrows.

3 DATA AND OPERATIONALIZATION

3.1 Data collection

During the fall of 2006 and 2007, 117 procurement managers from an equal number of Dutch companies in different branches and size categories took part in a two-hour expert meeting. Their participation was partly solicited through 'cold calling', partly from the social and business networks of Business Informatics students at Utrecht University as part of a 10-weeks master course. This type of data collection can be labeled as convenient random sampling (Triola, 2004) or respondent-driven sampling (Salganik and Heckathorn, 2004). The setting for the expert meetings (in six comparable sessions divided over two days) was the "policy lab" of Utrecht University, an electronic meeting room with GroupSystems software installed to support taking surveys and managing discussions (cf. Weatherhall & Nunamaker 1999).

Table 1 shows the composition of our respondent group by industry and the euro-value of goods purchased by the procurement function (purchase spend) as a relevant size indicator. Although the number of organizations/observations is not that large, their total purchase spend per year is quite large (55.2 billion Euro per year).

Sector	Purchase spend			Total
	< 50	50-500	>500	
Manufacturing	5	6	12	23
Utilities and construction	4	3	4	11
Healthcare	4	0	2	6
Wholesaler retail and logistics	4	14	8	26
Banking and Insurance	1	0	5	6
Professional service	6	5	1	12
Government and education	2	6	4	12
Other	9	7	5	21
Total	35	41	41	117

Table 1. Respondents by sector and yearly purchase spend (in mio)

During the meetings, the managers completed the surveys while in between oral group discussion about e-procurement were held. One questionnaire contained 12 questions about the company in general, including questions about their purchase portfolio and supply chain position. The second and main survey consisted of 15 questions related to the six procurement dimensions as presented above. Third, eight questions were posed by which the respondents self-estimated their procurement performance. Through the formulation of the items that the respondents were systematically reminded to answer all questions for 'their organization' and 'the spend category of focus' only.

Since the questionnaires were completed 'live' during the discussion meetings, i.e. in the presence of the facilitating students and researchers, the validity and reliability of the questions were checked directly at the spot. Only a small number of remarks and questions was received during the survey, which indicates that the respondents had no difficulties in understanding and answering the (large amount of) questions. The average time respondents spent on answering all questionnaires was approximately 45 minutes.

3.2 Measuring maturity

The respondents answered six sets of questions that measure the organization's current maturity on the six procurement dimensions. The maturity questions were formulated as items with 5-point scale answer categories (coded 1 for 'full disagree' to 5 as 'fully agree'). Table 2 below summarizes the

scores on the separate items (summarized by their keywords), as well on the procurement dimensions. For each of the six dimensions, the aggregation was computed by the un-weighted mean of the items scores. This aggregation is validated by significant correlation coefficients ($p < .01$) if a dimension was queried by two items (such as the strategy dimension), and reliability analysis (Chronbachs alpha is .70 or higher; Nunnally, 1978) if three or more items are part of the procurement dimension (such as the process dimension). It also appeared that the 15 maturity items can be aggregated into one latent overall maturity measurement as well, as the Chronbach's alpha is .86 and the one-factor solution using principle component analysis covers 61% explained variance.

Table 3 below summarizes the results of the maturity measurements. It shows that the overall maturity of the participating organizations is 3.05, which is above the midpoint of the generally applied 5-point scales. The average scores on the process maturity dimension is the highest (3.58), while the average score on the e-technology dimensions of the procurement function is relatively low (2.47). Looking at item level, we see that many respondent say they perform product selection in their procurement process, while far less agree with the statement that they apply e-technology for tactical purchasing processes. Standard deviations of most items and dimensions are limited to one unit of the 5-point scale.

Dimension	Item	Mean	SD
Overall Procurement maturity		3.05	0.80
Strategy		3.04	1.17
	Documentation and plan(s)	3.49	1.45
	Global sourcing	2.61	1.43
Processes		3.58	0.81
	Product specification	3.66	1.15
	Product selection	3.69	1.03
	Contracting	3.42	1.01
	Ordering	3.54	1.11
Control		3.18	0.91
	Process control	3.27	1.24
	Internal performance measuring	3.17	1.20
	Supplier performance measuring	3.10	1.18
Organization		3.26	1.11
	Purchasing department'	3.29	1.34
	Staff competences	3.23	1.26
Information		2.73	1.11
	Information processing	2.74	1.36
	Management information	2.72	1.18
E-technology		2.47	1.06
	Operational purchasing process	2.69	1.34
	Tactical purchasing process	2.25	1.14

Table 2. Average procurement maturity scores by dimension and item (N=117)

3.3 Measuring alignment

Alignment is defined earlier as the degree of leveling between the six business dimensions (cf. Scheper, 2002). This implies that the more the dimensions are at the same maturity level, the higher the alignment score. Different measurements can be used to operationalize this alignment concept.

Here, we first measure *misalignment* as the difference between the lowest and the highest maturity score (cf. Gonzalez-Benito, 2007; Batenburg & Versendaal, 2004). If, for instance, a company shows an array of average maturity scores of 4.1, 4.8, 4.2, 3.5, 1.2, and 2.6 on the six procurement maturity dimensions, the *misalignment* score is 3.6 (i.e. the difference between 4.8 as the highest score and 1.2 as the lowest score). A company that shows a straight array of six similar average maturity scores, by definition, reaches the primal level of alignment as the misalignment score is 0. For calculating the

alignment score, the reverse of this misalignment measure is taken (in formula: $1/(\text{MAX}[S_i, P_i, C_i, O_i, I_i, E_i] - \text{MIN}[S_i, P_i, C_i, O_i, I_i, E_i])$, where $S_i, P_i, C_i, O_i, I_i, E_i$ represent the respondents score on the Strategy, Process, Control, Organization, Information and E-technology maturity dimensions respectively). As a second measures, the standard deviation of the similar array of maturity scores is taken and likewise reserved to indicate the level of alignment (in formula: $1/\text{SD}[S_i, P_i, C_i, O_i, I_i, E_i]$).

Below we use both indicators to enable robustness checks on the analysis and outcomes. Intuitively, one might argue that alignment and maturity are positively correlated because the mature organizations will have the opportunity or capabilities to care about the balance between the procurement dimensions as well. Correlation analysis on our data set does not support this expectation however. Alignment correlate positively with overall maturity, but these correlation are far from significant ($r = +0.044$ and $+0.042$, with $p = .634$ and $.649$ if alignment is measure b the MAX-MIN- formula and the SD-formula respectively). This implies that leveling the procurement maturity scores is indeed an additional challenge for the procurement organization. We will elaborate on this matter in the next analysis section.

3.4 Measuring performance

Procurement performance was measured through eight questions about the perceived and relative success of the respondents' organization. Four questions were posed to the respondent to obtain an estimation of the procurement performance increase of the organization over the last two years. Four similar questions were posed to measure the extend to which the respondent's company outperforms its competitors with regard to procurement. Both the time and competitor related questions specified performance in four dimensions, i.e. procure-to-deliver, price of goods, quality of goods and transaction costs (cf. Gonzalez-Benito, 2007).

Table 3 shows the results of the two-dimensional performance measurement. Items were accompanied with the Likert answer scale ranging from 'strongly disagree' (coded as 1) to 'strongly agree' (coded as 5), similar to the maturity items. From the average scores in Table 3 it appears that, in general, respondents judge their procurement performance compared to competitors as somewhat lower compared to their performance improvement over time. This is probably due to the fact that the uncertainty about their previous performance is lower compared to the estimation of the competitor's performance, resulting more 'moderate' self-estimations.

	"In the last two years ..."		"Compared to our main competitors..."	
	Mean	SD	Mean	SD
... the average time, from purchase order to delivery has decreased	3.49	0.98	3.21	0.73
... the average number of purchased items that do not measure up to the agreed quality has decreased	3.43	0.95	3.16	0.69
...t the average purchase price of purchased items has decreased (controlled for the influence of market forces)	3.12	1.14	3.31	0.78
... the average purchase (process) costs per transaction for purchased items have decreased	3.32	0.97	3.22	0.73

Table 3. Average performance scores on four items queried by comparison over time and over competitors (N=117)

As with the procurement maturity measurement, reliability and factor analysis is performed to validate the aggregation of the eight performance items. The Chronbach's Alpha score of 0.65 support this, while the 31% explained variance for the one-factor solution in principle component analysis can be considered as satisfactory.

4 RESULTS

The basic hypothesis as defined by our research model concerns the relationship between procurement maturity and procurement performance. Assuming linearity, this can be expressed by the following regression model to be estimated:

$$\text{PERFORMANCE} = \alpha + \beta \text{MATURITY} + \varepsilon$$

As argues above, we primarily assume that alignment is a pure moderator, influencing the *shape* of the relationship between maturity and performance (cf. Sharma et al. (1981). This implies the above regression model can be extended written as:

$$\text{PERFORMANCE} = \alpha + \beta_1 \text{MATURITY} + \beta_2 \text{ALIGNMENT} \times \text{MATURITY} + \varepsilon$$

For both equations, it is expected that the maturity main effect (β and β_1), while we explore if in addition the interaction effect between maturity and alignment (β_2) has an additional (net) positive and significant effect as well. As second method to estimate the relevance of the maturity and maturity/alignment interaction effect, is to measure the *strength* of the expected relationship with performance. This is indicated by the explained variance of the regression model (R^2 as opposed to the magnitude of the error term). Through subgroup analysis, the explanatory power of model can be compared for different stages of the moderator, in this case the level of alignment.

Before presenting the subsequent results of the regression analyses, it should mentioned that both the dependent variable (procurement performance) and the independent variables (procurement maturity and alignment, measured in two are ways) are normally distributed. For the regression models, the error terms are normally distributed as well, nor are they significantly correlated with the predictors, showing no problems of heteroscedascity. The result of the first method to test our expectation is showed in table 4.

Estimated regression model	Standardized β	Standardized β_1	Standardized β_2	Adjusted R^2	F	p
PERFORMANCE = α + β MATURITY	.325***	-	-	0.098	13.324	.000
PERFORMANCE = α + β_1 MATURITY + β_2 MATURITY \times ALIGNMENT ^a	-	.277**	.062	0.091	6.713	.000
PERFORMANCE = α + β_1 MATURITY + β_2 MATURITY \times ALIGNMENT ^b	-	.308**	.021	0.090	6.615	.000

^a Alignment measured by: $1/(\text{MAX}[S_i, P_i, C_i, O_i, I_i, E_i]) - \text{MAX}[S_i, P_i, C_i, O_i, I_i, E_i])$.

^b Alignment measured by: $1/\text{SD}[S_i, P_i, C_i, O_i, I_i, E_i]$.

*** $p < .01$, ** $p < .05$, * $p < .10$.

Table 4. Regression analysis: predictive power of maturity and maturity-alignment for procurement performance (N=117)

The main conclusion from Table 4 is that maturity has a positive and significant effect on procurement performance. The hypothesized additional (net) effect of alignment is not significant however. This means that alignment does not influences the form of the relationship between maturity and performance. The explanatory power of the first basic model is limited (9.8%) and does not changes significantly if the maturity-alignment interaction is added (the p -value of the F -test on ΔR^2 is .000 for both alignment measurements). It can be understood though, that an organizations' procurement

performance (even if it is measured by perception of the respondent) is apparently related to many other factors that are not included in the model.

We further investigated if alignment has an effect on the size of the maturity-performance relation. This is done by subgroup analysis. We split the dataset into three groups of equal size, distinguishing between organizations with relative low, medium and relative high alignment scores, using the two types of measurements for alignment. Table 6 presents the results.

Table 6: Subgroup analysis: predictive power of maturity for procurement performance broken down by alignment level (N=117)

Estimated regression model / alignment level	Standard β	Adjusted R ²	F	P
PERFORMANCE = α + βMATURITY				
Low alignment ^a (n=39)	.415**	0.149	7.480	.010
Medium alignment ^a (n=39)	.167	0.004	1.151	.290
High alignment ^a (n=39)	.403**	0.137	6.394	.016
PERFORMANCE = α + βMATURITY				
Low alignment ^b (n=38)	.206	0.017	1.638	.209
Medium alignment ^b (n=42)	.090*	0.063	3.568	.067
High alignment ^b (n=37)	.422***	0.155	7.589	.009

^a Alignment measured by: $1/(\text{MAX}[S_i, P_i, C_i, O_i, I_i, E_i]) - \text{MAX}[S_i, P_i, C_i, O_i, I_i, E_i]$.

^b Alignment measured by: $1/\text{SD}[S_i, P_i, C_i, O_i, I_i, E_i]$.

*** p<.01, ** p<.05, * p<.10.

Two different results from Table 6 appear. For the first measurement of alignment, the medium alignment category shows a non-significant effect of maturity on performance while the other subgroups do. For the second alignment measurement, it appears that the magnitude and significance level of the maturity effect increases with the alignment level. This result supports the hypothesis that alignment strengthens the relation between maturity and performance. It should be reckoned however, that this result appears within one of the four robustness analysis only. As such, it only partly indicate that alignment indeed has an moderated role on the maturity-performance effect.

To achieve further robustness in the hypothesis testing, the relationships between maturity, alignment and performance are also investigated using the separate dimensions and items that build up the constructed variables. This allows us to increase the number of test occasions and explore the stability of results. As a result, it appears that the direct relationship between procurement maturity and procurement performance remains positive and significant for each of six separate dimensions and 15 different items. For none of the dimensions or items, the alignment-maturity interaction significantly effects performance. These result additionally supports our main findings. Also, if we estimate the regression models for the different performance items separately, the results remain consistent.

5 DISCUSSION AND CONCLUSIONS

In this paper we propose a research model to investigate the determination of an organization's procurement performance by its procurement maturity and alignment scores on six business dimensions, including e-technology. The proposition of the model is twofold: (1) procurement maturity will positively influence procurement performance, and (2) the level of alignment will strengthen the (positive relationship) between maturity and performance. To test these propositions, dedicated data is collected through surveying 117 Dutch organizations in a controlled setting of group decision meetings in 2006 and 2007. The resulting sample of organizations is diverse according to industry and procurement size (i.e. the average purchase spend), but cannot be considered as representative for the Dutch business population however.

Statistical analyses after construct validation shows that the first proposition is strongly confirmed. The net (regression) effect of an organizations' procurement maturity on procurement performance is significant and positive, and stable for the different dimensions of the maturity and performance construct. It should be noted that performance is subjectively measured by the respondent but in a comparative manner to avoid systematic under- or overestimations. The second proposition, the moderating effect of the alignment between the six dimensional maturity scores, is only partly confirmed. Alignment – measured by two indicators for the multidimensional maturity leveling – does not significantly effect the shape of the maturity- performance relation. For one of the alignment measurements though, subgroup analysis shows that the explanatory power of the maturity regression model indeed increase for categories with higher alignment scores. This result supports the proposition that alignment enforces the maturity-performance relation; this outcome is not stable for the other measurement of alignment however. Additional research as for our selection of business dimensions, maturity level and alignment (measurement) is needed for further explanation of the alignment data results.

While not all propositions behind our research model can be confirmed, the results do give base for practical suggestions. As maturity clearly matters for the (perceived) procurement performance of an organization, our maturity framework can be used as an assessment, benchmark and improvement tool for procurement organizations. And since it is developed and structured by the alignment or levelling principle, it enables organizations to formulate integrative procurement plans and design 'procurement improvement roadmaps'. As such it addresses the issues described by Adamson (2001), Pan and Parkes (2006), Puschman and Alt (2005) and Davila et al (2002) and it adds to the work of Beukers et al. (2006) and Kroese et al. (2008). In terms of maturity model types as described by De Bruin, Rosemann, Freeze and Kulkarni (2005) our conceptual procurement model falls into the categories of descriptive, prescriptive and comparative models, as it helps in assessing the procurement maturity, it provides directions for procurement strategy, and, it can be used leveraging existing assessment data. The procurement roadmaps define and monitor the actions and projects to bring a company to the next level of procurement maturity. While this can be supported by our measurement framework, its dimensions, and items, we should recognize that alignment in terms of procurement integration implies a more complex challenge. Creating a high level and balanced procurement situation paves the way to integration, but this requires additional polices and specific measurements. An interesting extension of this study would therefore be to develop measurements that indicate if and how organizations secure that their operational procurement processes are synchronized with the required control, information and e-technology activities. Also, further empirical research among procurement organizations is desirable to explore the effects of organizational contingencies and conditions on the procurement function, and to enable the design of a situational procurement framework.

References

- Accenture (2002), *The Buying Organisation Of The Future - 2002 European Procurement Survey*. Accenture.
- Adamson, J. (2001). Why is eProcurement alling?. In *Supply Management*, April 2001. The Chartered Institute of Purchasing & Supply.
- Adamson, J (1980). Corporate long-range planning must include procurement. *Journal of Purchasing and Materials Management*, 16, 25-32.
- Batenburg, R. and Versendaal, J. (2004). Business alignment in the CRM Domain: Predicting CRM performance. In: T. Leino, T. Saarinen & S. Klein, *Proceedings of the 12th European Conference on Information Sytems*. Turku: Turku School of economics and business Administration (CD-ROM).
- Beukers, M., Versendaal, J., Batenburg, R. and Brinkkemper, S. (2006). *The Procurement Alignment Framework: Construction and Application*, *Wirtschaftsinformatik* 48(5), 323-330.
- Berkowitz, M. and Mohan, K. (1987). The role of global procurement in the value chain of Japanese steel. *Colombia Journal of World Business*, 22, pp. 97-110
- Bozarth, C., Handfield, R. and Dasb, A. (1998). Stages of global sourcing strategy evolution: an exploratory study. *Journal of Operations Management* 16(2,3), 241-255.
- Cavinato, J.L. (1991). Evolving procurement organizations: logistics implications, *Journal of Business Logistics*, 13, 27-45.

- Cavinato, J.L. (1999). Fitting purchasing to the five stages of strategic management. *European Journal of Purchasing & Supply Management*, 5, 75-83.
- Cragg, P., King, M. and Hussin, H. (2002). IT alignment and firm performance in small manufacturing firms. *Journal of Strategic Information Systems*, 11(2), 109-132.
- Davila, A. Gupa, M. Palmer, R. (2002). Moving procurement systems to the internet: the adoption and use of e-Procurement technology models. *European Management Journal*, 21(1), 11-23.
- De Bruin, T., Rosemann, M., Freeze, R. and Kulkarni, U. (2005). Understanding the Main Phases of Developing a Maturity Assessment Model. 16th Australasian Conference on Information Systems, Sydney, 29 November – 2 December 2005.
- De Paoli, T. M. (1999). Re-engineering purchasing and supply. In J. L. Cavinato & R. G. Kauffman (Eds.), *The Purchasing Handbook: A Guide for the Purchasing and Supply Professional* (6th ed.) (311-329). New York, NY: McGraw-Hill.
- Earl, M.J. (1989). *Management Strategies for Information Technologies*. New Jersey: Prentice Hall.
- Galliers, R.D. and Sutherland, A.R. (1991). Information systems management and strategy formulation: the 'stages of growth' model revisited. *Journal of Information Systems*, 1, 89-114.
- Gonzalez-Benito, J. (2007). A theory of purchasing's contribution to business performance. *Journal of Operations Management* 25, 901-917.
- Hammer, M. and Champy, J. (1994). *Reengineering the corporation: a manifesto for business revolution*. New York, Harper Business.
- Helms, R.W., Batenburg, R.S. and Versendaal, J.M. (2006). PLM Roadmap: Stepwise PLM implementation based on the concepts of maturity and alignment. *International Journal of Product Lifecycle Management*, 01(04), 333-351.
- Henderson, J.C. and Venkatraman, N. (1993). Strategic alignment: Leveraging information technology for transforming organizations. *IBM Systems Journal*, 32(1), 4-16.
- Herberling, M.E. (1993). The rediscovery of modern purchasing, *International Journal of Purchasing and Materials Management*, 29, 48-53.
- Humphreys P.K. Li, W.L. Chan, L.Y. (2004). The impact of supplier development on buyer-supplier performance. *International Journal of Management Science*, 32(2), 131-143.
- Kearns, G.S. and Lederer, A.L. (2000). The effect of strategic alignment on the use of IS-based resources for competitive advantage. *Journal of Strategic Information Systems*, 9(4), 265-293.
- Kraljic, P. (1983). Purchasing must become Supply Management, *Harvard Business Review*, Sep-Oct.
- Lancioni, R.A. Smith, M.F. Oliva, T.A. (2000). The role of internet in supply chain management-logistics catches up with strategy. *Industrial Marketing Management*, 29(1), 45-56.
- Kroese, E., Den Teuling, J., Versendaal, J., Batenburg, R. and Van de Kamp-Slootweg, H. (2008). , Aligning procurement: An e-procurement mapping and deployment model. 17th International Purchasing & Supply Education & Research Association (IPSERA) Conference, Perth, Australia, 9 - 12 March 2008.
- Leavitt, H.J. (1965), Applied organizational change in industry. In: March, J.G. *Handbook of organizations*. Chicago (Ill.): Rand McNally.
- Luftman, J.N., Lewis, P.R. and Oldach, S.H. (1993). Transforming the enterprise: The alignment of business and information technology strategies. *IBM Systems Journal*, 32(1), 198-221.
- Malone, T.W, Yates, J. and Benjamin, R.I. (1987). Electronic Markets and Electronic Hierarchies. In: *Information Technology and the Corporation of the 1990s: Research Studies*, T.J. Allen and M.J. Scott Morton (eds.), Chapter 3, 61-83.
- Monczka, R. M., Trent, R. J. (1991). Global Sourcing- A Development Approach, *International Journal of Purchasing and Materials Management*, 27(2), 2-8.
- Nolan, R. (1979). Managing the crises in data processing, *Harvard Business Review*, 2, March-April.
- Nunnally, J., (1978). *Psychometric Theory*. McGraw-Hill, New York.
- Pan G. and Parkes, A. (2006) Successfully Turning Around a Failing E-procurement Project: Lessons from a UK Borough Council. *Proceedings of the 17th Australasian Conference on Information Systems*, Adelaide, Australia.
- Peppard, J. and Ward, J. (1999). 'Mind the Gap': diagnosing the relationship between the IT organisation and the rest of the business. *Journal of Strategic Information Systems*, 8(1), 29-60.
- Puschman, T., Alt, R. (2005). Successful use of e-procurement in supply chains. *Supply chain management*, 10(2), 122-133.
- Porter, M.E. (1985). *Competitive Advantage*. New York, The Free Press.
- Porter, M.E. (2001). Strategy and the Internet. *Harvard Business Review* (March-April) 63-78.

- Salganik, M.J. and Heckathorn, D.D. (2004) Sampling and Estimation in Hidden Populations Using Respondent-Driven Sampling. *Sociological Methodology* 34 193-239.
- Scheper, W.J. (2002). Business IT Alignment: solution for the productivity paradox (In Dutch). Deloitte & Touche, Netherlands.
- Scott-Morton, M.S., & Allen, T.J. (1994), *Information technology and the corporation of the 1990's*. New York: Oxford University Press.
- Speckman, R. (1981) A Strategic Approach to Procurement Planning. *Journal of Purchasing and Materials Management*, Winter, pp. 3-9.
- Sutton, B. (1989). Procurement and its role in corporate strategy: an overview of the wine and spirit industry, *International Marketing Review*, 6, 49-59.
- The New Procurement Mandate: Growing within Tomorrow's Supply Webs. Retrieved 23 November 2007 from: <http://www.atkearneyprocurementsolutions.com/news/mandate.pdf>.
- Toole T. Donaldson B. (2002) Relationship performance dimensions of buyer-supplier exchanges. *European Journal of Purchasing and Supply Management*, 8(4), 197-207.
- Triola, M.F. (2004). *Elementary Statistics*. Ninth Edition. Boston, Pearson Education.
- Turban, E., McLean, E. and Wetherbe, J. (1999). *Information technology for management: making connections for strategic advantage*. Chichester, England: John Wiley & Sons.
- Versendaal, J., Brinkkemper, S. (2003). Improvement Framework for Buyer-Owned Electronic Trading Exchanges: Procurement at Komatsu America Corp. – Peoria Manufacturing Operations. Institute of computing and information sciences, Utrecht University.
- Ward, J. and Peppard, J. (2003), *Strategic planning for information systems*, 3rd edition, Chichester, England, Wiley.
- Weatherhall, A. and Nunamaker, J. (1999). *Getting results from electronic meetings*. Chichester, England: St. Richard's Press.
- Weele, van, A.J. (2001), *Purchasing and supply Chain Management: Analysis, Planning and Practice* (3rd revised ed.), London, England: Thomson International.
- Weele, van, A.J., Rietveld, G. (2000). Professional Development of Purchasing in Organisations: Towards a Purchasing Development Model.. *Global Purchasing & Supply Chain Strategies* - December 2000. retrieved from <http://www.bbriefings.com>
- Zheng, J., Caldwell, N., Harland, C., Powell, P., Woerndl, M. and Xu, S., Small firms and e-business: cautiousness, contingency and cost-benefits. *Journal of Purchasing & Supply Management*, 10(1), 27-39.