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## Investigating the Impact of Procurement Alignment on Supply Chain Management Performance

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### Abstract

The increasing emphasis that organizations are placing on purchasing and supply chain management over the past decade, has set the spotlight on the potential of procurement systems. However, the majority of studies still examine IT adoption enablers despite the fact that procurement systems are perceived as a commodity in modern enterprises. Studies that examine the post-adoption conditions that facilitate performance gains in the supply chain management domains still remain scarce. In this paper we investigate the effect of business/IT-alignment within the procurement domain in order to determine if it affects procurement performance. Additionally, we examine the impact that supply chain management governance centralization has in attaining procurement alignment. In order to answer these questions, a sample of 172 European companies was analyzed by means of Partial Least Squares (PLS) modeling. Our results empirical support our hypotheses that procurement alignment leads to increased performance over time and in relation with competitors, with the effect of the former being greater than the latter. Additionally, we find that contrary to empirical evidence supporting the statement that a decentralized structure enables e-procurement adoption, governance centralization of supply chain management decisions fosters procurement alignment.

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## 1. Introduction

Due to increased competitiveness, organizations today are forced to become more agile, innovative and deliver high quality products within shorter cycles while being able to reduce transaction costs. The ability to effectively manage supply chain activities has been documented as a strong determinant of securing a competitive advantage and improving organizational performance since it is perceived as a driver of productivity [34]. The importance of supply chain management is reflected in expenditures, with organizations spending on average over 70% of their revenues on related activities. This fact has attracted the interest of academics especially regarding the potential of information technology in the field of supply chain management [2], [44]. The adoption of electronic procurement systems has been a subject of much attention during the past decade, with a large number of studies stressing potential benefits which include reduced procurement costs, higher quality of purchased goods, better supplier relationship and many more [20], [8], [22], [44], [49]. Consequently there has been a large stream of research examining adoption enablers and inhibitors for supply chain management Information Technology (IT) [42], [55].

However, despite heavy investments in IT, organizations often fail to realize improvements in their performance. This paradox, i.e., the productivity paradox [10], has lead researchers as well as consultants to go beyond isolating adoption factors, and examine post-adoption aspects that facilitate the leveraging of their investments [14]. This productivity paradox is also apparent in the field of purchasing and supply management, with practitioners struggling to increase the associated value of their investments on procurement systems [44]. Both in scientific literature and in practice, it is a well-known fact that identifying key factors that contribute to increasing performance from IT investments, is a crucial step in order to leverage the maximum potential benefits. However, for the procurement domain, there still seems to be a lack of solid quantitative research in this manner, with most studies focusing on enablers and inhibitors of adoption rather than on performance contributors [1], [3], [13], [49], [25], [45].

The objective of this paper is to examine the post-adoption conditions that enable firms to realize performance gains from their procurement investments. More specifically, we apply a business-IT alignment view in order to determine if the coherency between elements of the procurement function lead to performance gains. The alignment perspective has been one of the predominant ways of determining the impact of IT, and has been examined both at a generic [7], as well as domain level [6], [41]. The main proposition is that in order to realize any performance gains, IT must be in congruence with strategy and operations [46]. Within the domain of supply chain management, research regarding post-adoption aspects of IT and how they impact performance remains scarce. To this end, the aim of this paper is to determine if procurement alignment leads to performance gains, and if so how can they be best measured. In order to do so we distinguish between two types of relevant supply chain performance measures, competitive performance and performance over time. Furthermore, we examine how centralization of the procurement process effects procurement alignment.

This paper is structured as follows. In the next section, a literature overview is presented on the most relevant and recent work on business-IT alignment, supply chain management performance and governance structures. Based on the theoretical argumentation we derive hypotheses and formulate a model to be tested empirically. Section 3 introduces the sample used and the measurement methods in order to operationalize the concepts. Section 4 presents the results by applying Partial Least Squares (PLS) modeling techniques, along with measures of validity and reliability. In the final section conclusions are drawn based on the findings and implications are highlighted for academics and practitioners. Additionally, we propose some directions for further research which are grounded on our findings and limitations.

## 2. Theoretical Background

For many years, researchers have recognized that adopting IT will not automatically result in enhanced performance, but rather it must be in alignment with business needs. Business-IT alignment has been conceptualized in literature in a number of ways, but in essence refers to applying IS/IT in an appropriate and timely way and in harmony with business strategies, goals, and needs [37]. The importance of business/IT-Alignment on performance is also confirmed by IS/IT practitioners and organization executives, whom for the past two decades, identify it as one of their top concerns [35], [38]. The benefits of attaining a state of business-IT alignment have been documented extensively in literature, and among others include market growth, cost control, financial performance, innovation, and reputation [14]. For these reasons, academics have been motivated to study alignment. Although alignment was initially examined at a generic enterprise-wide level, recent publications have recognized the importance of more fine-grained approaches, focusing on specific domains [18], IT systems [39], IT architectures [41], and even economic regions [16]. The basis for this is that alignment may not be a beneficial state in certain contexts, and even if it is, the factors that enable the attainment of this state may be differentiated.

Procurement alignment is grounded on this notion. Following the idea presented in the Strategic Alignment Model (SAM), which identifies domains within a business that must be in balance, and in congruency with the notion of “vertical linking process” [27], we build upon the domains that Turban et. al., [51] define. According to this framework, the purchasing and supply management domain can be distinguished into actions relating to Strategy, Processes, Control, Organization, Information, and IT. This perspective has been operationalized in past practical instruments like the European Foundation for Quality Management (EFQM) Excellence Monitor ([www.efqm.org](http://www.efqm.org)) and McKinsey’s 7S-model [53]. The main proposition of these theories is that management should aim for the development of coherent and mutually supportive functional domains in order to realize performance increase. Consequently, we define procurement alignment as the degree of balance between these six dimensions within the purchasing and supply management domain.

These business dimensions have been applied and measured in a number of empirical studies that empirically validate them, however, their association with supply chain performance still remains unexamined [4], [26], [8], [33]. Furthermore, studies adopting an alternative approach in measuring procurement alignment, validate their hypothesis through theoretical reasoning [32], or through a small number of case studies in a specific region [15]. Hence, the positive association of procurement alignment on supply chain management performance cannot be confirmed with certainty.

### 2.1. Alignment Performance

The performance impact of IT is one of the most important research topics, with a vast amount of papers proposing ways by which the effects of investments can be quantified. Traditional firm-level economic analysis has been rendered as unsuited in many occasions in determining the short and long-term impacts of IT, with scholars suggesting alternative measures as more appropriate reflections of IT value [48]. In IT literature it is argued that the effects of information systems should be measured over time [11] and in comparison with competitors [40]. The former measure has been mostly used to capture the change in operational efficiency compared to a pre-adoption state or between certain time-frames of post-adoption. The later on the other hand reflects the competitive position which an enterprise is in at a given time in relation with its main antagonists as a result of IT investments [34]. The two types of measures are complementary since they reflect the internal and external performance of a firm with studies to date applying both performance indicators.

Within the IS literature it has been argued that a state of alignment between business and IT will have an impact on a firm's performance which can be only be realized over time [5]. These performance gains cannot be measured in terms of traditional economic outcomes, but rather through operational efficiency measures [12]. Additionally, alignment has been noted as being a facilitating factor for gaining a competitive advantage [29]. The main proposition of studies supporting this statement is that even if companies adopt IT, if it is not in congruence with the strategic objectives of a firm it cannot result in a superior competitive position [30]. A competitive advantage implies a distinct attraction to customers in comparison with competitors as a result of superior competencies, capabilities and resources which cannot easily be translated into economic values.

With regard to procurement IT investments, studies indicate the value of IT is often not easy to transfer to corporate-level executives since it cannot be quantified by traditional economic measures [44]. Additionally, investing in IT to support procurement activities does not automatically result in a competitive advantage or an increase of operational efficiency [56]. Based on the above findings and in conjunction with previous argumentation, we advocate that in order to derive value from procurement investments they must be in congruence with other aspects of the procurement functions. Hence, we hypothesize the following:

*H1: Procurement alignment affects operational efficiency of supply chain management over time positively.*

*H2: Procurement alignment positively affects the competitive position of a firm's supply chain management activities.*

## 2.2. Governance Structure

Governance structure has been conceptualized in literature in various ways and includes activities of task allocation, coordination, and supervision which are directed towards the achievement of organizational goals [17]. Most studies examine structure in terms of distribution of decision rights and measure it according to the centralization/decentralization of decision rights appropriation [23]. The choice between a centralized and decentralized governance structure is an age-old debate in academic literature with the advantages and disadvantages of each being documented extensively [28]. The main supporting argument of a decentralized governance structure is achieving flexibility, while centralizing decisions rights is associated with efficiency of operations.

Considering the domain of supply chain management, the degree centralization/decentralization concerns the extent to which the power to make supply chain management decisions is concentrated in an organization [37]. Studies have also tried to identify the relationship between supply chain management governance structures with performance by examining if organizational goals are achieved. We contend that the allotment of decisions rights for supply chain management activities will influence procurement alignment, since within the jurisdiction of these are activities performed through procurement IT systems. We support our proposition on studies that manifest associations between corporate and IT governance structure with alignment [9]. Thus, we can consider that the governance scheme will act as an antecedent of business-IT alignment. In IS literature there are numerous studies concerning how the appropriation of decision rights influences business-IT alignment, however there are mixed findings regarding the optimal scheme to achieve alignment [36]. This is mainly attributed to additional factors that have synergistic effects with the governance scheme, such as sector, function etc. Within the supply chain management domain it is argued that a greater degree of control can be achieved by centralized operations and decision rights [19]. Extending on this notion, the study proposes that procurement IT adoption will be benefited by a centralized governance structure, since in a

decentralized arrangement there is insufficient knowledge accumulation and opportunistic behaviors that serve as distortions to the procurement strategy. We therefore hypothesize the following:

*H3: Procurement alignment will be positively affected by a centralized governance scheme.*

### **3. Data & Measurements**

#### *3.1. Data Collection*

The target population consisted of firms that have deployed IT systems that support their procurement function, and operate in an array of business domains of different size categories. Respondents were invited to fill out custom built questionnaires through direct two-hour sessions held at the Department of Information and Computing Sciences of Utrecht University. Their participation was solicited through ‘cold calling’, mostly from the social and business networks of Business Informatics students at Utrecht University. This form of data collection is known as convenient random sampling [50] or respondent-driven sampling [47]. In order to eliminate non-response bias, firm representatives that did not attend the direct sessions despite being invited, were asked to either fill out a digital questionnaire or participate in a brief phone interview covering the main topics of the research study. The gathering of the data was performed over a period of three years (2006-2008) and resulted in a sample of 172 companies. The majority of the replies were from employees that held managing positions in the purchasing and supply management department and were highly knowledgeable about the process.

Our sample covered the entire range of enterprise sizes from micro to large. We adopt this categorization in accordance with the size-class proposed by the European Commission Recommendation of the 6th of May 2003 (2003/361/EC) with the group of large (+250 employees) firms accounting for 52,9% of the sample and SME`s (1-250 employees) for 47,1%. During the meetings, the respondents filled out the questionnaires which were divided into three main sections. The first section contained 12 questions about the company in general, including questions about the purchase portfolio, governance structure and supply chain position that the respondent holds. The second and main part was made up of 15 questions related to the six procurement dimensions on which the concept of alignment is grounded. The third and final part, included questions concerning the enterprises supply chain management performance. A preliminary version of the questionnaire was reviewed by a group of procurement experts through interviews in order to validate its adherence to the constructs that are to be tested. During the direct sessions, facilitating students and researchers answered respondent’s queries regarding any items of the questionnaire that were not clear to them. The average time that respondents spent of answering all items from the three categories was approximately 45 minutes.

#### *3.2. Construct Measurements*

Procurement alignment is developed as a second-order construct reflecting the balance between the six dimensions of the procurement process [8]. For each of the six dimensions which are identified to be critical for the procurement process a number of questions were formulated as items with 5-point scale answer categories congruent to the five stages of purchasing evolution as defined by Van Weele [52]. These five stages comprise evolutionary stages of maturity, where 1 denotes a transactional orientation level and 5 an external integration. The dimensions of the procurement function which the five maturity stages are applied to are: Strategy (STG), Processes (PRC), Control (CNT), Organization (ORG), Information (INF), and IT (IT). Therefore, an enterprise with aligned procurement functions is one where all six dimensions are in congruency in terms of their maturity.

For the two constructs related to performance subjective measures were used asking respondents to evaluate the perceived operational efficiency over time (TPERF) and in comparison with competitors (CPERF). The use of subjective over objective measures is considered as a valid approach in determining performance since the perceived results are to a great extent a true reflection of actual performance [21]. Additionally, when attempting to quantify operational efficiency improvements over time and in relation with competitors, financial measures may not represent any fluctuations. Moreover, since respondents in their majority hold top-level management positions in the supply chain management department we assume that they are well informed, thus, the information which they provide is accurate and reliable [43]. Each of these two perspectives is represented on the questionnaire as four questions in which respondent's state to which level they agree to the statement mentioned, from "Strongly disagree" to "Strongly agree" on a 5-level likert scale. The items used to quantify performance were adapted from the study of Gunasekaran et al., [24].

Finally, the structure of the supply chain management domain was measured in terms of centralization/decentralization of decision rights. In accordance with past studies, we distinguish between centralized buying structure, federated structure, and non-hierarchical (decentralized) structure [19]. Hence, we measure the construct of governance centralization on a three level scale with 3 representing a centralized governance, 2 a federated one, and 1 a decentralized structure.

#### 4. Analysis

In order to test the hypotheses formulated above we use Partial Least Squares (PLS) modeling since it allows for the development of second-order latent constructs. Our dataset of 172 responses surpasses the threshold of observations required according to the Smart PLS documentation.

The reliability of items was examined by testing that item loadings were above 0.7 for first and second order constructs. Additionally, convergent validity was tested so that construct Average Variance Extracted (AVE) was above the value of 0.5, and internal consistency of construct values for Composite Reliability was above 0.7. Finally, in order to test for discriminant validity we compared AVE values to inter-construct correlations so that the former are greater than the later. We performed the reliability and validity testing in two phases; an initial one for first order constructs of alignment, and then for the constructs used in the structural model.

Table 1. Descriptive Statistics and Reliability Measures

Construct	Number of items	Mean	Std. Deviation	AVE	Composite Reliability
Strategy	2	3,14	1,14	0.663	0.797
Processes	4	3,55	0,80	0.543	0.820
Control	3	3,18	0,94	0.643	0.843
Organization	2	3,26	1,06	0.722	0.838
Information	2	2,74	1,07	0.732	0.845
IT	2	2,51	1,02	0.698	0.821
Alignment	15	3,06	0,77	0.687	0.903
Competitive Performance	3	3,20	0,45	0.636	0.772
Performance over time	3	3,29	0,70	0.639	0.773

Having performed all necessary reliability tests we then proceed to test the hypotheses by means of PLS analysis. Initially, we examine the effects of alignment on the two performance measurements and investigate if the centralization of decision rights has an impact on attaining a state of procurement alignment. Through a

bootstrapping procedure with replacement taking 1000 subsamples we estimate significance of causal effects. The results are depicted in the structural model in Fig. 1.

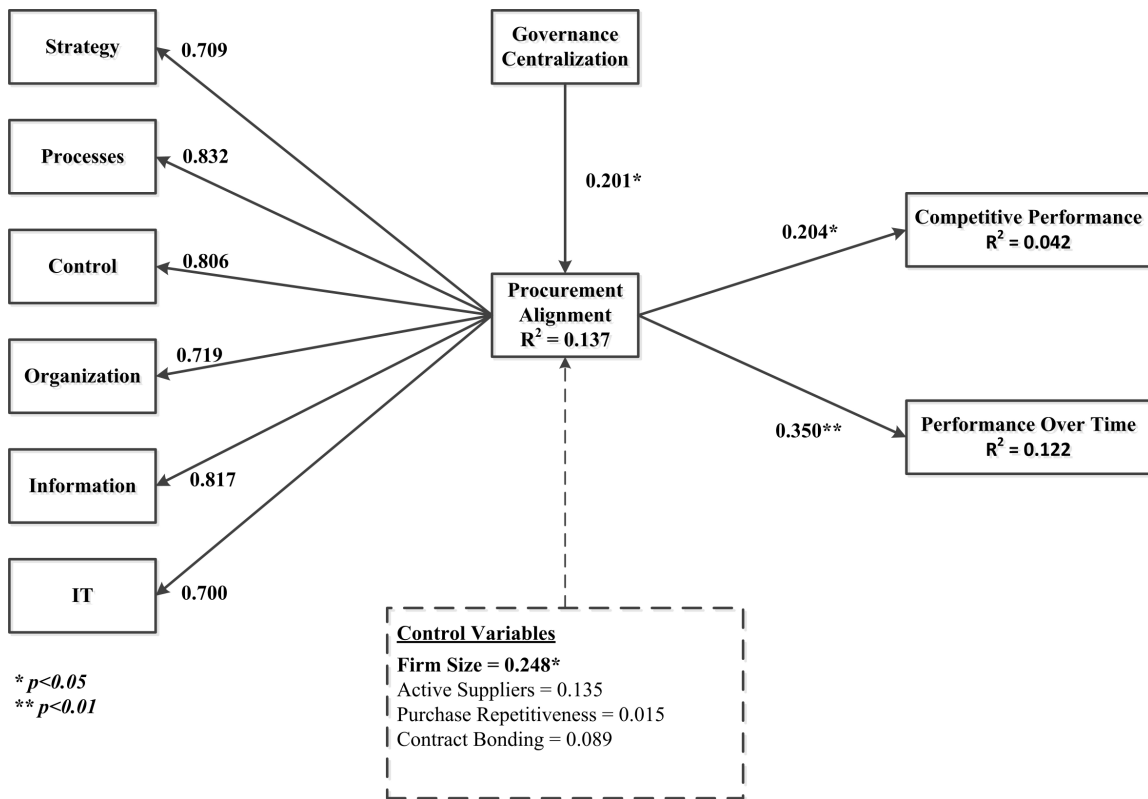


Fig. 1. Structural Model with Path Coefficients

With regard to the association of procurement alignment to supply chain management performance both linkages yield a positive and significant effect. More specifically, H1 which examines the impact that procurement alignment has on performance over time has a highly significant effect ( $\beta = 0.350$   $p < 0.01$ ). Although the explained variance is at the rather low percentage of 12,2% ( $R^2 = 0.122$ ), we must consider that it is the result of only one construct. Similarly H2 is confirmed since procurement alignment is found to have a significant and positive impact on competitive performance ( $\beta = 0.204$   $p < 0.05$ ). Competitor performance is explained by 4,2% ( $R^2 = 0.042$ ) by procurement alignment, thus representing a weaker link than with performance over time. This finding suggests that the relative competitive position of an enterprise with its antagonists may be better explained by other constructs.

Although explained variance is at a rather low level this doesn't undermine results since the association of procurement alignment on both performance measurements is positive and significant. Regarding aspects that facilitate the attainment of procurement alignment, we find that the centralization of the supply chain management decision rights positively influences the attainment of such a state ( $\beta = 0.201$   $p < 0.05$ ), thus

confirming H3. However, the explanatory power of governance centralization in achieving procurement alignment and in conjunction with other control variables is relatively low 13,7% ( $R^2 = 0.137$ ) which calls for further investigation of enablers.

## 5. Conclusions & Implications

In modern enterprises it has become common practice to adopt procurement IT systems in order to automate and increase efficiency of the supply chain. Despite the widespread adoption of e-procurement systems, academic research is still largely concerned with adoption enablers and inhibitors. Few studies to date examine post-adoption aspects that facilitate increased performance from IT investments. This study attempts to fill this gap by examining if business-IT alignment within the procurement domain leads to performance gains of the supply chain management. Additionally, we examine how the appropriation of decision rights influences the attainment of this state.

The results of the structural model support the hypothesis that procurement alignment has a positive impact of supply chain management performance. More specifically, we distinguish between two measures of performance, performance over time, and performance gains compared to competitors. It is found that aligning the dimensions of the procurement domain has a positive and significant effect on both measures, with the former being a stronger association than the latter. Performance gains experienced over time are explained by 12,2% by procurement alignment with a highly significant association. The competitive position of the enterprise in comparison with its antagonists is also found to be affected by procurement alignment, however to a lesser extent. These findings have important implications for practitioners since they prove that it is not sufficient to adopt procurement systems, but that a certain degree of coherency between elements must be attained in order to realize benefits. Despite some counter-arguments on the effects of business-IT alignment which state that it constitutes an enterprise as rigid, the positive impact on competitive performance proves that it enables enterprises in gaining a competitive edge in terms of operations. Therefore we can infer that procurement alignment should be a sought after state with the supply chain management domain.

The finding that procurement alignment impacts positively on supply chain management performance should promote research in determining factors that facilitate in attaining this state. In IS research numerous studies have been performed on aspects that enable the attainment of fit between business and IT, however, it has been argued that domain specific studies yield more fine-grained results. To this extent we examined how the appropriation of decisions rights impacts procurement alignment, with results indicating that the more centralized the governance of supply chain management is, the higher the degree of procurement alignment. Although this finding is not valid for the generic case of business-IT alignment it is significant for e-procurement alignment, thus proving that there may be additional aspects that are domain-specific.

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