

2014

Business alignment in the procurement domain: a study of antecedents and determinants of supply chain performance

Patrick Mikalef
Ionian University

Adamantia Pateli
Ionian University

Ronald Batenburg
Utrecht University

Rogier Wetering
Utrecht University

Follow this and additional works at: <https://aisel.aisnet.org/ijispm>

Recommended Citation

Mikalef, Patrick; Pateli, Adamantia; Batenburg, Ronald; and Wetering, Rogier (2014) "Business alignment in the procurement domain: a study of antecedents and determinants of supply chain performance," *International Journal of Information Systems and Project Management*. Vol. 2 : No. 1 , Article 4. Available at: <https://aisel.aisnet.org/ijispm/vol2/iss1/4>

This material is brought to you by AIS Electronic Library (AISeL). It has been accepted for inclusion in International Journal of Information Systems and Project Management by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact elibrary@aisnet.org.



Business alignment in the procurement domain: a study of antecedents and determinants of supply chain performance

Patrick Mikalef

Ionian University
Department of Informatics
Tsirigoti Square 7, Corfu 49100
Greece
www.shortbio.net/mikalef@ionio.gr

Ronald Batenburg

Utrecht University
Institute of Information and Computing Sciences
P.O Box 80.089, Utrecht 3508TB
The Netherlands
www.shortbio.net/r.s.batenburg@uu.nl

Adamantia Pateli

Ionian University
Department of Informatics
Tsirigoti Square 7, Corfu 49100
Greece
www.shortbio.net/pateli@ionio.gr

Rogier van de Wetering

Utrecht University
Institute of Information and Computing Sciences
P.O Box 80.089, Utrecht 3508TB
The Netherlands
www.shortbio.net/r.vandewetering@uu.nl

Abstract:

With organizations now placing an increasing amount of attention on the management of their supply chain activities, the role of Information Technology (IT) in supporting these operations has been put in the spotlight. In spite of extensive research examining how IT can be employed in various activities of supply chain management, the majority of studies are limited in identifying enablers and inhibitors of adoption. Empirical studies examining post-adoption conditions that facilitate performance improvement still remain scarce. In this study we focus on procurement as part of the supply chain management activities. We apply the business-IT alignment perspective to the domain of procurement, and examine how certain organizational factors impact the attainment of this state. Additionally, we research the effect that procurement alignment has on supply chain management performance. In order to do so, we apply Partial Least Squares (PLS) analysis on a sample of 172 European companies. We find that firms that opt for a centralized governance structure, as well as larger firms, are more likely to attain a state of procurement alignment. Furthermore, our results empirically support the statement that procurement alignment is positively correlated with operational efficiency and competitive performance of the supply chain.

Keywords:

business-IT alignment; SCM performance; empirical analysis; governance structure; firm size; e-procurement.

DOI: 10.12821/ijispm020103

Manuscript received: 30 April 2013

Manuscript accepted: 12 November 2013

1. Introduction

In response to the increasingly competitive environment, organizations are under pressure to become more agile in their operations, accelerate their innovation process, and deliver products within shorter cycles while minimizing cost. The effective management of supply chain activities is regarded as a top priority in doing so. Empirical findings show that organizations with efficacious supply chains manage to increase organizational performance and secure a competitive edge over their rivals [1]. The realization of the importance of supply chain related activities is evident by expenditures, which average at 70% of total organizational revenues. This fact has attracted the interest of academics especially regarding the potential of information technology in the field of supply chain management [2],[3]. In particular, efforts have concentrated on the use of technology to support the procurement process which is considered to be the cornerstone of supply chain management. Adopting electronic procurement systems has been argued to result in a number of improvements, such as reduced procurement costs, higher quality of purchased goods, shorter delivery times, and better relationships with suppliers amongst others [4]-[6]. Subsequently, there has been much focus on identifying adoption enablers and inhibitors for electronic adoption procurement systems [7],[8].

Although studies that examine adoption enablers provide insight as to what aspects foster or hinder adoption of information Technology (IT) systems, they do not explain under what conditions they result in improvements in performance. This is a well noted problem in Information Systems (IS) literature, i.e., the productivity paradox, in which organizations that spend heavily on IT may not realize any performance gains from their investments [9]. This problem is also apparent in the domain of supply chain management, with practitioners struggling to increase the associated value of their investments on electronic procurement systems [3]. This has lead researchers to go beyond isolating adoption factors, and examine post-adoption conditions and elements that facilitate organizations to leverage their IT investments [10]. Discovering the conditions under which organizations can harness the maximum potential from their IT investments is now regarded as a crucial step in order to realize performance gains and outperform competitors. However, most research studies regarding electronic procurement are still delineating adoption enablers and inhibitors, with few quantitative studies examining post-adoption performance contributors [11]-[15].

The objective of this study is to fill this void by examining the post-adoption conditions that enable firms to realize performance improvement from the electronic procurement investments. To do so, we apply the business-IT alignment view in order to determine if the coherency between elements of the procurement function leads to performance gains. The alignment perspective has been one of the predominant theoretic-states for determining the impact of IT, and has been examined both at a generic [16], as well as at a domain-specific level [17],[18]. The main idea is that in order to realize any performance gains, IT must be in congruence with strategy and operations [19]. Within the domain of supply chain management, research regarding post-adoption aspects of IT and how they impact performance still remains scarce. Therefore, the aim of this paper is to determine what antecedents lead to enhanced business-IT alignment in the procurement domain, and to examine whether such a state is beneficial with respect to performance. Hence, we examine how a set of elements of the organizational structure (procurement centralization/decentralization and organizational size), may act as antecedents in achieving procurement alignment. Additionally, we research if attaining a state of alignment within the procurement domain (procurement alignment) leads to performance gains, and if so, what are the appropriate methods to measure them. In order to do so we distinguish between two types of performance indicators to evaluate the impact of procurement alignment; these are competitive performance and performance over time. Consequently, our research question can be broken down in to two sub-questions:

«Which organizational elements foster the attainment of procurement alignment?»

«Is achieving a state of procurement alignment positively related with supply chain management performance?»

Based on survey data gathered from 172 European companies we conducted an empirical study. In the next section we overview literature on business-IT alignment, and based on theoretical argumentation we derive a set of hypotheses in order to actualize the research objectives. In section 3 the data gathering process is explained and construct measures

are presented. In section 4 we conduct tests for the measurement model (validity and reliability) and empirically test our conceptual model by means of Partial Least Squares (PLS) analysis. In closing we discuss the implications that the outcomes of this research have for practitioners and academics. Additionally, limitations are highlighted and directions for future research are suggested.

2. Theoretical Background

Researchers have recognized that adopting IT will not automatically result in enhanced performance, but rather, it must be in coherence with business needs [20]. In order to conceptualize this degree of fit between business and IT strategies, academics have put forth the notion of business-IT alignment. In essence the concept of business-IT alignment refers to applying IS/IT in an appropriate and timely way and in harmony with business strategies, goals, and needs [20]. The importance of business-IT alignment however is not limited to academic studies, with practitioners consistently ranking it at the top of their concerns [21]. Attaining a state of business-IT alignment has been found to result in a number of performance gains, including market growth, cost control, financial performance, increased outflow of innovation, and augmented reputation [10]. These findings have motivated researchers to study business-IT alignment from two main perspectives [22]: a) to identify antecedents affecting its attainment; and b) to examine how it impacts performance.

Antecedents of business-IT alignment have been studied quite extensively with a number of critical success factors recurring in numerous studies. These antecedents are mostly concerned with the social context between business and IT executives. Reich and Benbasat [23] found that in terms of attaining long term alignment, shared domain knowledge is a prerequisite. Communication between business and IT personnel is also noted as being a critical success factor since it is associated with understanding and increased locus of comprehension [23],[24]. Teo and Ang [25] compiled a list of 12 antecedents of alignment which include top management support and knowledge scope, communication between business and IT, and IT department responsiveness and creativity.

Extensive debate has also revolved around the impact that business-IT alignment has on organizational performance. Although the majority of studies advocate that alignment leads to performance gains, there are some counter-arguments which posit that in certain occasions it may not be desirable. Those in favor of alignment highlight that when attaining a state of alignment, companies are able to make more focused and strategic use of IT, thus leading to increased performance [22]. Other studies also support this finding and empirically demonstrate that firms' that manage to align their business and IT strategies will outperform competitors [26]. In contrast, a number of scholars make the argument that alignment is not a beneficial state since tightly coupled arrangements may have negative outcomes, especially in turbulent environments [27].

Although business-IT 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 [28], IT systems [29],[30], IT architectures [18], and even economic regions [31]. The rationale for opting for such approaches is that alignment may have antecedents and outcomes that are contingent upon certain contextual and organizational factors. We advocate that in the domain of supply chain management, antecedents and outcomes of business-IT alignment may contrast past findings. Following the idea presented in the Strategic Alignment Model (SAM) [32], which identifies domains within a business that must be in balance, we build the concept of procurement alignment upon the domains that Turban et al., [33] 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) and McKinsey's 7S-model [34]. The main proposition of these frameworks is that management should aim for the development of coherent and mutually supportive functional domains in order to realize performance gains. Consequently, we define procurement alignment as the degree of balance between these six dimensions within the purchasing and supply management domain. Although alignment under these dimensions has been empirically put to test in a number of contexts, antecedents and performance outcomes for procurement alignment

still remains under-researched [17],[35],[36]. Furthermore, studies adopting an alternative approach in examining procurement alignment validate their hypotheses through theoretical reasoning [37], or through a small sample size [13]. Hence, the antecedents and outcomes of procurement alignment still remain unexamined through survey-based research.

2.1 Antecedents of Procurement Alignment

Despite the importance of antecedents of alignment applicable at the general level, scholars argue that certain organizational factors also have an impact on attaining a state of alignment [10]. However these factors are contingent upon the domain in which they are examined. In the present study we examine how aspects pertaining to governance structure and size affect a firm's level of procurement alignment. We base this decision on past findings which suggest that these factors are important predictors of alignment; however, they are contingent upon the domain examined [22].

Governance structure is concerned with activities relating to task allocation, coordination, and supervision which are directed towards the achievement of organizational goals [38]. In the majority of studies structure is measured as the degree of centralization/decentralization of decision rights [39]. The choice between a centralized and decentralized governance structure has been extensively researched, with a decentralized governance structure being more appropriate for achieving flexibility, while a centralized scheme is associated with efficiency of operations [40]. Within IS literature a number of studies have examined how governance impacts business-IT alignment; however findings regarding the optimal scheme still remain inconclusive [41].

With regard to the domain of supply chain management, the degree of centralization/decentralization concerns the extent to which the power to make supply chain management decisions is concentrated in an organization. The allotment of decisions rights for supply chain management activities could affect procurement alignment, since within the jurisdiction of these are activities performed through procurement IT systems. We base this argument on past findings which manifest associations between corporate and IT governance structure with alignment [42]. Hence, we consider that the governance scheme will act as an antecedent of business-IT alignment. In the domain of supply chain management it is argued that a higher degree of control can be achieved by centralizing operations and decision rights [43]. Extending on this notion, we postulate that procurement alignment will benefit from a centralized governance structure. Hence, we hypothesize that:

H1: Stronger governance centralization will correlate with higher levels of procurement alignment.

The impact of firm size has been extensively researched in IS research, in studies ranging from the area of innovation development, organizational planning, coordination competence, and ethical predispositions to IT adoption. Outcomes from these studies indicate that firm size is indeed an important predictor, with companies belonging to different size classifications exhibiting differentiating results and dynamics. With regard to alignment, Chan et al., [22] found that larger firms were able to attain higher levels of alignment. The authors argue that this occurs since larger firms have formal processes and structures which ensure the attainment of alignment. Additionally, they have more slack resources and wealth to invest in technologies to support their business objectives. Therefore, we can expect that for procurement alignment firm size will be a strong determinant. Thus, we hypothesize:

H2: Firm size will correlate positively with higher levels of procurement alignment.

2.2 Alignment Performance

The impact of IT on performance has been an extensively studied area, with a vast amount of papers proposing ways by which the effects of investments can be quantified. Traditional firm-level economic analysis has been deemed as ineffective in determining the short and long-term impacts of IT, with scholars suggesting alternative measures as more appropriate reflections of IT value [44]. The position of scholars is that the effects of information systems should be examined over time [45] and in benchmark with competitors [46]. 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 of a firm in relation with its antagonists as a result of IT investments [1]. These performance measurements are complementary since they reflect the internal and external change in firm performance.

IS literature suggests that a state of alignment between business and IT will have an impact on a firms performance which can be only be identified over time [47]. These performance fluctuations are not reflected by traditional economic outcomes, but are recognizable with measures quantifying change in operational efficiency [48]. Moreover, alignment has been found to have a positive impact on a firms` competitive advantage [26]. The outcomes of these studies show that gaining a competitive edge over antagonists is not possible by simply adopting IT, but rather firms should aim for congruence with business objectives [26]. A competitive advantage implies a superiority in terms of competencies, capabilities and resources which cannot be translated easily into economic figures.

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 [3]. Additionally, studies indicate that simply adopting IT systems to support procurement activities does not automatically result in a competitive advantage or an increase in operational efficiency [49]. Based on the above findings, and in conjunction with previous argumentation, we advocate that value from procurement investments is derived by the alignment with other activities of the procurement functions. Hence, we hypothesize the following:

H3: Higher levels of procurement alignment will correlate with increased operational efficiency of supply chain management over time.

H4: Higher levels of procurement alignment will correlate with on the competitive performance of supply chain management.

3. Data & Measurements

3.1 Data Collection

The main target group consisted of firms that had deployed IT systems to support their procurement function, and operate various industries. Respondents were invited to the Department of Information and Computing Sciences of Utrecht University to fill out custom built questionnaires through direct two-hour sessions. Their participation was solicited through 'cold calling', mostly from the social and business networks of Business Informatics students at Utrecht University. This method of data collection is known as convenient random sampling [50] or respondent-driven sampling [51]. 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. 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 as shown in Table 1.

Our sample covered the entire range of enterprise size classes from micro to large. We adopted this categorization in accordance with the size-class proposed by the European Commission Recommendation of the 6th of May 2003 (2003/361/EC). In adherence with this categorization, large firms (+250 employees) accounted for 52.9% of the sample and SMEs (1-250 employees) 47.1% of the total. During the meetings, 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 comprised of 15 questions related to the six procurement dimensions on which the concept of alignment is grounded. The 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 were 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.

Table 1. Frequency of responses by respondents' position

Respondents' Position	N	%
Procurement Director	27	15.7
Supply Chain Manager	14	8.1
Purchasing Manager/Head of Procurement	39	22.7
Initial Buyer/Strategic Buyer	20	11.6
Purchasing Analyst/Supply Chain Analyst	21	12.2
Assistant Buyer/Administrative Buyer/Logistical Buyer	16	9.3
Procurement Employee (Facilitating)	14	8.1
Controller	9	5.2
Boardroom Director (No Procurement Director)	12	7.0
Total	172	100.0

3.2 Construct Measurements

Procurement alignment (ALIGN) was developed as a second-order reflective construct measuring the fit between the six dimensions of the procurement process [6]. For each of the six dimensions which were 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 et al., [52]. These five stages comprise evolutionary stages of maturity, where 1 denotes a transactional orientation level and 5 an external integration level. The five dimensions of the procurement function were: *Strategy (STG)*; *Processes (PRC)*; *Control (CNT)*; *Organization (ORG)*; *Information (INF)*; and *IT (IT)*.

The structure of the supply chain management domain was measured in terms of centralization/decentralization of decision rights. In accordance with past studies, we distinguished between centralized buying structure, federated structure, and non-hierarchical (decentralized) structure [42]. Hence, we measured the construct of *governance centralization (GOVC)* on a three level scale: [3=] representing centralized governance; [2=] a federated one; and [1=] a decentralized structure. *Firm size (SIZE)* was operationalized by applying the size-classes proposed by the European Commission with respondents having to select if their company belonged to the micro [=1]; small [=2]; medium [=3]; or large [=4] class.

Two constructs related to performance, were measures by asking respondents to evaluate the *perceived operational efficiency increase* over a period of two years (*TPERF*) and the firms' *perceived competitive position (CPERF)*. The use of subjective instead of objective measures is being considered as a useful approach in determining performance since the perceived results are to a great extent a true reflection of actual performance [53]. Additionally, when attempting to quantify operational efficiency improvements over time or in relation with competitors, financial measures may not exhibit any change. Since respondents held top-level management positions in the supply chain management department we assume that they were well informed, thus, the information which they provided is accurate and reliable [54]. Each perspective was measured through the questionnaire by four questions in which respondents were asked to if they agreed or disagreed to the statement presented on a 5-level Likert scale ("Strongly disagree" [=1] to "Strongly agree" [=5]). The items used to quantify performance were adapted from the study of Gunasekaran et al. [55].

4. Empirical Analysis

4.1 Measurement Model

In order to empirically examine our hypotheses we employed Partial Least Squares (PLS) analysis. The choice of PLS was based on its ability to operationalize and test second-order constructs as well as examine complex causal relationships. More specifically, we used the statistical software package SmartPLS [56]. The total sample of 172 valid responses exceeds the set threshold of observations required according to the SmartPLS documentation for the number of hypotheses and constructs examined.

Before proceeding to the examination of causal relationships, the reliability and validity of constructs was examined. We assessed reliability through measures of composite reliability and average variance extracted (AVE). All values of composite reliability were above 0.77, thus exceeding the required threshold of 0.7 [57]. Additionally, AVE values exceeded the lower limit of 0.5 [58]. Validity of constructs was determined through convergent and discriminant validity tests. Convergent validity was assessed by examining if items loaded significantly on their respective constructs (loadings of above 0.7). Items that did not comply with these requirements were omitted. Discriminant validity was established by testing if square roots of AVE for constructs (diagonal bolded values) were greater than any other inter-construct correlation as presented in Table 2.

Table 1. Assessment of reliability and discriminant validity of constructs

Composite Reliability	Average Variance Extracted		1.	2.	3.	4.	5.
0.90	0.69	1. ALIGN	0.83				
1.00	1.00	2. SIZE	0.30	1.00			
1.00	1.00	3. GOVS	0.19	0.03	1.00		
0.77	0.64	4. TPERF	0.35	0.07	0.09	0.80	
0.77	0.64	5.CPERF	0.20	0.00	0.03	0.26	0.80

Since the construct of procurement alignment was developed as a second-order reflective construct, reliability and validity tests were also necessary [59]. We therefore examined if each of the six underlying dimensions of procurement alignment exhibited sufficient levels of reliability and validity. For each dimension reliability was established since the lowest values of AVE (0.64) and composite reliability (0.80) greatly exceeded set thresholds. The same applied for discriminant validity where for all constructs the square root of AVE surpassed inter-construct correlation values. For convergent validity each constructs item loadings were tested, with all remaining values being above 0.71. Additionally, we established that all first-order construct loadings were above 0.7 in relation with the second-order construct of procurement alignment.

4.2 Structural Model

To determine the hypothesized associations of the conceptual model we employed a two-stage approach of structural analysis. We adopted this approach since it is deemed as most suited in cases where the interest is only for the second-order construct, and not for the underlying dimensions [60]. The bootstrap approach (200 re-samples) was applied in order to determine the significance of causal relationships. Fig. 1 presents the outcomes of the PLS analysis from the two-step approach using latent variable scores to estimate inner model weights and significance levels.

Business alignment in the procurement domain: a study of antecedents and determinants of supply chain performance

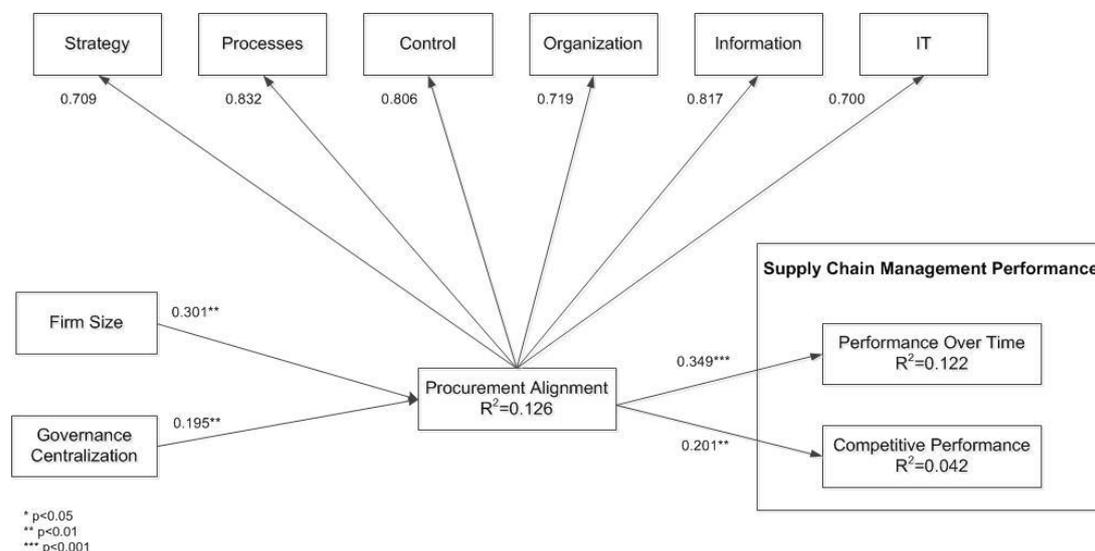


Fig. 1. Structural Model with Path Coefficients

The outcomes of the empirical analysis confirm the hypotheses formulated in section 3. More specifically, we found that from the antecedents conjectured to impact procurement alignment, both governance structure and firm size are significantly correlated. Specifically, we found that a centralized governance structure correlates with procurement alignment, thus supporting H1 ($\beta=0.195$, $t=2.848$). Past studies have found that the impact of governance structure on alignment is contingent upon the domain in which it is examined; therefore findings have not been consistent [61]. The relation between governance centralization and procurement alignment for the supply chain management domain is found to be positive and significant at a $p=0.001$ (99%) probability level. In adherence with the study of Chan et al., [22], we find that larger firms manage to align the elements of their procurement function more effectively than smaller firms ($\beta=0.301$, $t=3.936$). This correlation is highly significant at a p -value of 0.01 (99%), hence confirming H2. Despite these two positive associations, the explanatory power of our conceptual model regarding procurement alignment is limited to an explained variance of 12.6% ($R^2=0.126$). This finding is an indication that other foreground antecedents of alignment have a stronger influence on procurement alignment as noted in past studies. Regarding the relation between procurement and performance, we find that it is positive and significant for both performance measures. For operational efficiency increase over time, results indicate that procurement alignment has a positive and significant relation on this ($\beta=0.349$, $t=4.677$). This outcome validates our hypothesis (H3), which states that firms that effectively manage to align the various dimensions of the procurement function will realize improvements in their operations, at a probability level of $p=0.001$ (99.9%). A positive and significant association is also discovered for the influence of procurement alignment on competitive performance ($\beta=0.201$, $t=2.904$). This shows that soliciting fit between elements of the internal domain can have a positive relation on a firm's supply chain management position in relation with its competitors (H4 accepted). The explanatory power of our conceptual model is 12.2% ($R^2=0.122$) for operational efficiency performance, and 4.2% ($R^2=0.042$) for competitive performance of supply chain management. These outcomes are an indication that there are additional factors that determine a firm's supply chain management performance which should be examined.

In order to examine the combined relation between governance structure and firm size on alignment in greater detail we plot the interaction effects for the three measures. From Fig. 2 it is apparent that for any organizational size-class a centralized governance structure correlates with higher levels of alignment. For large firms we observe that

procurement alignment does not differ to a great extent when comparing the centralization of governance structure. In contrast, for companies belonging to the SME classification, the more centralized the governance structure, the greater the degree of procurement alignment. The only exception is for small firms which exhibit lowest levels of procurement alignment under federated governance structures. The outcomes of the partial least squares analysis are also apparent on the interaction plot, with larger firms exhibiting greater levels of procurement alignment. For SME's and micro firms in particular there is a high level of disparity for procurement alignment in relation to large firms. For any type of governance structure, large firms have procurement alignment levels above 2.50 whereas firms belonging to the SME categorization have a significantly lower average procurement alignment of approximately 1,.50. This outcome shows that regardless of the governance structure chosen larger firms are more capable of attaining alignment in their procurement function.

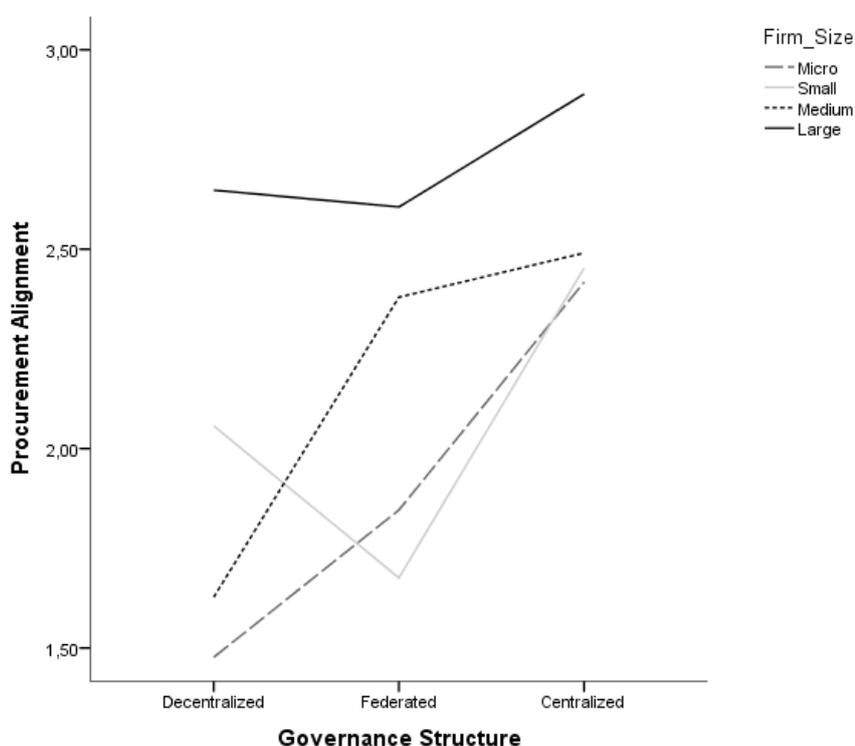


Fig. 2. Interaction Plot of Antecedents on Procurement Alignment

5. Conclusion

In spite of much attention being given to adoption enablers and inhibitors of supply chain management related IT, we still know very little about how these investments yield performance gains. This is due to the fact that literature has greatly disregarded conditions and facilitating factors that foster improvements as a result of IT investments. The predominant view has been to identify aspects that drive adoption of such systems, with the rationale being that adoption will automatically result in improved performance. In order to increase understanding on what conditions enable performance realizations, we employ the widely used alignment perspective. Adapting this perspective for the procurement functions, we seek to uncover antecedents of procurement alignment and performance outcomes. We centered on the procurement function since it is regarded as being the cornerstone of supply chain management.

Building on past studies we formulate a set of hypotheses which are put to test based on survey data from 172 European companies. Results demonstrate several key findings as well as some differences compared to past studies.

One of the most studied aspects of business-IT alignment has been with regard to antecedents. Past studies have found that a number of foreground antecedents such as business-IT communication, top management support, and shared domain knowledge affect alignment. Although these factors apply in any context, there are some elements which are noted as being contingent upon the domain in which they are examined. In this study we analyzed the impact that governance structure and firm size have on procurement alignment. Past studies have been inconclusive regarding the impact that governance structure has on alignment. In this study we find that the greater the degree of centralization of the supply chain management decisions rights, the higher the realized levels of procurement alignment. This finding can be justified on the basis that since decisions are made centrally, it is easier to manage the various elements related to procurement, and thus achieve a state of balance and coherence between them. In contrast, if decisions are made in a decentralized manner it is likely that decisions and investments made by one department may not support operations of others. Hence, for the function of procurement, results indicate that it is optimal for firms to coordinate operations through a centralized governance structure if the aim is to attain alignment.

With regard to firm size, few studies have examined the impact that it may have on business-IT alignment, with the majority stressing that larger firms' are more likely to attain such a state. Consistent with past findings the outcomes of the empirical analysis indicate that larger firms manage to attain a state of procurement alignment to a greater degree than smaller firms. This can be explained by the fact that larger firms have more financial resources to invest in specific areas or IT to support their supply chain management activities. Additionally, larger firms are more likely to adopt formal processes and use standards, therefore enabling alignment. Although smaller firms have less activities and people to coordinate, this relation is mitigated by opting for a centralized governance scheme. Hence, the size of a firm correlates with its ability to achieve procurement alignment. Although these two antecedents are found to be significant determinants of procurement alignment, the explanatory power of the structural model indicates that there are additional aspects that determine a firms' fit between elements of its procurement function. This provides a basis for future research directions to examine other factors that shape procurement alignment. Extending past studies it is important to understand how the turbulence of the external environment drive alignment and through what mechanisms firms can dynamically manage to align their procurement process.

In order to examine if procurement alignment is indeed a desired state, we empirically test how it determines supply chain management performance. Adapting the notion that business-IT alignment significantly correlates with performance in a positive manner, we conjecture that the ability to align the dimensions of the procurement function will have a positive impact on supply chain management performance. Building upon suggestions in the IT literature, we distinguish between two measures of supply chain management performance. These measures are quantified through perceptions of respondents, which are deemed as more appropriate when determining IT investments compared to strictly financial measures. With regard to the first measure of supply chain management performance, operational efficiency increase, we find that procurement alignment correlates with this positively and significantly. According to this finding, companies that manage to align their procurement function perceive an increase of operational efficiency in comparison with two years prior. This outcome shows that procurement alignment enables firms to operate more effectively with regard to their supply chain management activities. However, this is not the sole determinant of procurement alignment, since we find that it also has a positive and substantial relationship with the competitive position of a firm. Results show that procurement alignment facilitates firms to outperform their competitors with regard to their supply chain management performance. The reasons why alignment fosters performance gains have been well documented in literature. In this study we support the notion that alignment is positively correlated with the outcomes for supply chain management. Therefore, procurement directors and top management staff should not only opt to invest in IT, but should also aim for mutually supporting activities of procurement with IT. Disregarding a certain area of the procurement process may severely impact the overall performance of the supply chain.

Although these findings shed light on the importance of procurement alignment and on factors that promote it, there are additional aspects that future research should aim to address. One critical point which is not taken into account in the present study is the impact that environmental turbulence may have on both the attainment of procurement alignment, and on its performance outcomes. The impact of the external environment has become ever more important especially with the dependence of collaborating partners. Future ventures should examine if procurement alignment is indeed a desired state in conditions of high volatility, or could agility be more meaningful in such situations. In settings where companies are required to switch suppliers on an ad-hoc basis it is likely that aiming to create mutually supportive domains may not be a first priority. Furthermore, aspects regarding the type of IT investments made as well as the flexibility of infrastructure could complement the examination of performance enablers. It is likely that investing in a flexible IT infrastructure will have a positive effect on attaining a state of procurement alignment especially in circumstances of frequent operational changes. We encourage researchers to examine these and other aspects relating to post-adoption conditions of supply chain management IT since initial findings from this research provide promising results. In conjunction with the growing importance of IT in the supply chain management domain, there is room for extensive research with many practical and theoretical implications.

References

- [1] S. Li, B. Ragu-Nathan, T. Ragu-Nathan, and S. Subba Rao, "The impact of supply chain management practices on competitive advantage and organizational performance," *Omega*, vol. 34, pp. 107-124, April, 2006.
- [2] R. Batenburg and J. Versendaal, "Maturity Matters: Performance Determinants of the Procurement Business Function," in *ECIS*, Galway, Ireland, 2008, pp. 563-574.
- [3] W. D. Presutti Jr, "Supply management and e-procurement: creating value added in the supply chain," *Industrial Marketing Management*, vol. 32, pp. 219-226, April, 2003.
- [4] K. Eyholzer and D. Hunziker, "The Use of the Internet in Procurement: An Empirical Analysis," in *ECIS*, Vienna, Austria, 2000, pp. 335-342.
- [5] A. Davila, M. Gupta, and R. Palmer, "Moving Procurement Systems to the Internet: the Adoption and Use of E-Procurement Technology Models," *European Management Journal*, vol. 21, pp. 11-23, February, 2003.
- [6] M. Beukers, J. Versendaal, R. Batenburg, and S. Brinkkemper, "The Procurement Alignment Framework Construction and Application," *WIRTSCHAFTSINFORMATIK*, vol. 48, pp. 323-330, October, 2006.
- [7] K. A. Patterson, C. M. Grimm, and T. M. Corsi, "Adopting new technologies for supply chain management," *Transportation Research Part E: Logistics and Transportation Review*, vol. 39, pp. 95-121, March, 2003.
- [8] C. Zhang and J. Dhaliwal, "An investigation of resource-based and institutional theoretic factors in technology adoption for operations and supply chain management," *International Journal of Production Economics*, vol. 120, pp. 252-269, July, 2009.
- [9] E. Brynjolfsson, "The productivity paradox of information technology," *Communications of the ACM*, vol. 36, pp. 66-77, December, 1993.
- [10] Y. E. Chan and B. H. Reich, "IT alignment: what have we learned?," *Journal of Information Technology*, vol. 22, pp. 297-315, September, 2007.
- [11] K. Arbin, "E-procurement maturity in industry," *International journal of electronic business*, vol. 1, pp. 396-407, May, 2003.
- [12] R. Batenburg, "E-procurement adoption by European firms: a quantitative analysis," *Journal of Purchasing and Supply Management*, vol. 13, pp. 182-192, May, 2007.

- [13] H. L. Chang, K. Wang, and I. Chiu, "Business-IT fit in e-procurement systems: evidence from high-technology firms in China," *Information Systems Journal*, vol. 18, pp. 381-404, April, 2008.
- [14] M. M. Rahim, "Identifying factors affecting acceptance of e-procurement systems: An initial qualitative study at an Australian City Council," *Communications of the IBIMA*, vol. 3, pp. 7-17, September, 2008.
- [15] T. S. Teo and K. h. Lai, "Usage and performance impact of electronic procurement," *Journal of Business Logistics*, vol. 30, pp. 125-139, May, 2009.
- [16] F. Bergeron, L. Raymond, and S. Rivard, "Ideal patterns of strategic alignment and business performance," *Information & Management*, vol. 41, pp. 1003-1020, November, 2004.
- [17] E. Bendoly and F. R. Jacobs, "ERP architectural/operational alignment for order-processing performance," *International Journal of Operations & Production Management*, vol. 24, pp. 99-117, January, 2004.
- [18] P. Mikalef and A. Pateli, "A Systematic Meta-analytic Review on Factors Influencing the Strategic Alignment in Service-Oriented Architecture Projects," in *Proceeding of the 6th Mediterranean Conference on Information Systems, MCIS*, Limassol, Cyprus, 2011, p. 58.
- [19] B. H. Reich and I. Benbasat, "Measuring the linkage between business and information technology objectives," *MIS quarterly*, vol. 20, pp. 55-81, March, 1996.
- [20] J. Luftman and T. Brier, "Achieving and sustaining business-IT alignment," *California management review*, vol. 42, pp. 109-122, September, 1999.
- [21] J. Luftman, R. Kempaiah, and E. H. Rigoni, "Key issues for IT executives 2008," *MIS Quarterly Executive*, vol. 8, pp. 151-159, June, 2009.
- [22] Y. E. Chan, R. Sabherwal, and J. B. Thatcher, "Antecedents and outcomes of strategic IS alignment: an empirical investigation," *Engineering Management, IEEE Transactions on*, vol. 53, pp. 27-47, February, 2006.
- [23] B. H. Reich and I. Benbasat, "Factors that influence the social dimension of alignment between business and information technology objectives," *MIS quarterly*, vol. 24, pp. 81-113, March, 2000.
- [24] B. Campbell, "Alignment: Resolving Ambiguity within Bounded Choices," in *PACIS*, Bangkok, Thailand, 2005, p. 54.
- [25] T. S. Teo and J. S. Ang, "Critical success factors in the alignment of IS plans with business plans," *International Journal of Information Management*, vol. 19, pp. 173-185, April, 1999.
- [26] G. S. Kearns and A. L. Lederer, "A Resource-Based View of Strategic IT Alignment: How Knowledge Sharing Creates Competitive Advantage," *Decision Sciences*, vol. 34, pp. 1-29, June, 2003.
- [27] M. R. Vitale, B. Ives, and C. M. Beath, "Linking information technology and corporate strategy: an organizational view," in *Proceedings of the Seventh International Conference on Information Systems*, San Diego, California, U.S.A., 1986, p. 17.
- [28] P. Cragg, M. King, and H. Hussin, "IT alignment and firm performance in small manufacturing firms," *The Journal of Strategic Information Systems*, vol. 11, pp. 109-132, June, 2002.
- [29] J. K. Chan and M. K. Lee, "SME e-procurement adoption in Hong Kong-The roles of power, trust and value," in *Proceedings of the 36th Annual Hawaii International Conference on System Sciences*, Big Island, Hawaii, 2003, p. 10.
- [30] A. Madapusi and D. D'Souza, "Aligning ERP systems with international strategies," *Information Systems Management*, vol. 22, pp. 7-17, December, 2005.

- [31] L. Chen, "Business–IT alignment maturity of companies in China," *Information & Management*, vol. 47, pp. 9-16, January, 2010.
- [32] D. Avison, J. Jones, P. Powell, and D. Wilson. "Using and validating the strategic alignment model." *The Journal of Strategic Information Systems*, vol. 13, pp. 223-246, September, 2004.
- [33] E. Turban, D. Leidner, E. McLean, and J. Wetherbe, *Information Technology for Management: Transforming Organizations in the Digital Economy*, 5th ed. New Jersey, U.S.A.: John Wiley & Sons, 2006.
- [34] R. H. Waterman Jr, T. J. Peters, and J. R. Phillips, "Structure is not organization," *Business Horizons*, vol. 23, pp. 14-26, June, 1980.
- [35] R. Batenburg, R. Helms, and J. Versendaal, "PLM roadmap: stepwise PLM implementation based on the concepts of maturity and alignment," *International Journal of Product Lifecycle Management*, vol. 1, pp. 333-351, October, 2006.
- [36] P. Mikalef, A. Pateli, R. Batenburg, and R. van de Wetering, "Investigating the Impact of Procurement Alignment on Supply Chain Management Performance," *Procedia Technology*, vol. 9, pp. 310-319, December, 2013.
- [37] D. Knudsen, "Aligning corporate strategy, procurement strategy and e-procurement tools," *International Journal of Physical Distribution & Logistics Management*, vol. 33, pp. 720-734, October, 2003.
- [38] J. Child, "Organizational structure, environment and performance: the role of strategic choice," *Sociology*, vol. 6, pp. 1-22, January, 1972.
- [39] R. Batenburg and J. Versendaal, "Maturity Matters: Performance Determinants of the Procurement Business Function," in *ECIS*, Galway, Ireland, 2008, pp. 563-574.
- [40] M. Jensen and W. Meckling, "Specific and general knowledge and organizational structure," in *Contract Economics*, L. Werin and H. Wijkander, Eds., 1st ed. Oxford, United Kingdom: Blackwell Publishers, 1992, pp. 251-291.
- [41] J. Luftman and R. Kempaiah, "An update on business-IT alignment: "A line" has been drawn," *MIS Quarterly Executive*, vol. 6, pp. 165-177, September, 2007.
- [42] C. V. Brown and J. S. Renwick, "Alignment of the IS organization: the special case of corporate acquisitions," *ACM SIGMIS Database*, vol. 27, pp. 25-33, September, 1996.
- [43] S. R. Croom, "The Impact of Web-Based Procurement on the Management of Operating Resources Supply," *Journal of Supply Chain Management*, vol. 36, pp. 4-13, December, 2000.
- [44] P. Tallon, K. L. Kraemer, and V. Gurbaxani, "Executives' perceptions of the business value of information technology: a process-oriented approach," *Journal of Management Information Systems*, vol. 14, pp. 145-174, April, 2000.
- [45] E. Brynjolfsson and L. M. Hitt, "Beyond computation: Information technology, organizational transformation and business performance," *The Journal of Economic Perspectives*, vol. 14, pp. 23-48, September, 2000.
- [46] N. Melville, K. Kraemer, and V. Gurbaxani, "Review: Information technology and organizational performance: An integrative model of IT business value," *MIS quarterly*, vol. 28, pp. 283-322, June, 2004.
- [47] H. Benbya and B. McKelvey, "Using coevolutionary and complexity theories to improve IS alignment: a multi-level approach," *Journal of Information Technology*, vol. 21, pp. 284-298, December, 2006.
- [48] J. M. Burn and C. Szeto, "A comparison of the views of business and IT management on success factors for strategic alignment," *Information & Management*, vol. 37, pp. 197-216, June, 2000.

- [49] F. Wu, S. Yeniyurt, D. Kim, and S. T. Cavusgil, "The impact of information technology on supply chain capabilities and firm performance: a resource-based view," *Industrial Marketing Management*, vol. 35, pp. 493-504, May, 2006.
- [50] M. F. Triola, W. M. Goodman, G. LaBute, R. Law, and L. MacKay, *Elementary statistics*, 12th ed. Boston, U.S.A.: Pearson/Addison-Wesley, 2006.
- [51] M. J. Salganik and D. D. Heckathorn, "Sampling and estimation in hidden populations using respondent-driven sampling," *Sociological methodology*, vol. 34, pp. 193-240, December, 2004.
- [52] A. Van Weele, F. Rozemeijer, and G. Rietveld, "Professionalising purchasing in organizations: towards a purchasing development model," in *Proceedings of the 7th Annual IPSERA Conference*, London, United Kingdom, 1998, pp. 5-7.
- [53] G. G. Dess and R. B. Robinson, "Measuring organizational performance in the absence of objective measures: The case of the privately-held firm and conglomerate business unit," *Strategic Management Journal*, vol. 5, pp. 265-273, July, 1984.
- [54] T. C. Powell, "Total quality management as competitive advantage: a review and empirical study," *Strategic Management Journal*, vol. 16, pp. 15-37, January, 1995.
- [55] A. Gunasekaran, C. Patel, and R. E. McGaughey, "A framework for supply chain performance measurement," *International Journal of Production Economics*, vol. 87, pp. 333-347, February, 2004.
- [56] C. M. Ringle, S. Wende, and S. Will, (2005) "SmartPLS 2.0 (M3) Beta, Hamburg," Available: <http://www.smartpls.de>.
- [57] J. C. Nunnally and I. Bernstein *Psychometric Theory 3E*, 3rd ed. Blacklick, Ohio, U.S.A.: Tata McGraw-Hill Education, 1994.
- [58] C. Fornell and D. F. Larcker, "Evaluating structural equation models with unobservable variables and measurement error," *Journal of marketing Research*, vol. 18, pp. 39-50, February, 1981.
- [59] S. B. MacKenzie, P. M. Podsakoff, and N. P. Podsakoff, "Construct measurement and validation procedures in MIS and behavioral research: integrating new and existing techniques," *MIS quarterly*, vol. 35, pp. 293-334, June, 2011.
- [60] J.-M. Becker, K. Klein, and M. Wetzels, "Hierarchical latent variable models in PLS-SEM: guidelines for using reflective-formative type models," *Long Range Planning*, vol. 45, pp. 359-394, October–December, 2012.
- [61] C. V. Brown and S. L. Magill, "Alignment of the IS functions with the enterprise: toward a model of antecedents," *MIS quarterly*, vol. 18, pp. 371-403, December, 1994.

Appendix A. Questionnaire Items

Procurement Alignment

For your organization, please check one checkbox per statement. The degree of professionalism increases from (1) not professional to (5) very professional.

Strategy

- | | |
|--|---|
| <i>Documentation and plan(s)</i> | <ol style="list-style-type: none"> 1. No action plan 2. Formalized action plan focusing on purchasing price reduction 3. Policy plan 4. Policy plan derived from organizational goals 5. Policy plan, action plan and account plans for major (internal) customers and suppliers |
| <i>Global sourcing (= the degree in which your organization develops an international supply base)</i> | <ol style="list-style-type: none"> 1. Not, mainly domestic (national) purchasing 2. Suggested by other departments because e.g. compensating obligations, focusing on price reduction 3. As part of the purchasing strategy focusing on price reduction 4. As part of the overall business (organizational) strategy in the frame of risk spreading and/or access to certain markets 5. As 4), tuned to long term plans and/or technology road map of the business units |

Processes

- | | |
|------------------------------|--|
| <i>Product specification</i> | <ol style="list-style-type: none"> 1. No specification available 2. Only technical product specification 3. Technical and functional product specification 4. Technical and functional product specification and requirements for the supplier 5. As 4), using supplier knowledge (Early Supplier Involvement, Collaborative Engineering) |
| <i>Product selection</i> | <ol style="list-style-type: none"> 1. Based on experience and gut-feeling 2. Based on product price only 3. Based on product price, delivery time and other factors 4. Based on market research, pre-selection and other objective factors 5. As 4), but with TCO (Total Cost of Ownership) calculation and/or risk analysis |
| <i>Contracting</i> | <ol style="list-style-type: none"> 1. Just an oral agreement 2. Purchase ordering for which the price is determined by pricing list of supplier or earlier order 3. Framework contract including logistical, legal and quality constraints (e.g. through purchasing conditions) 4. Framework contract, including performance indicators 5. Contract containing mutual obligations with regard to performance improvement (for quality, logistical, innovation and cost improvement) |
| <i>Ordering</i> | <ol style="list-style-type: none"> 1. Oral ordering or ordering by telephone 2. Based on internal order/requirements; prices determined during actual ordering; no contract-based ordering |

Business alignment in the procurement domain: a study of antecedents and determinants of supply chain performance

3. Based on internal order/requirements; prices based on a contract
4. On paper, based on internal order; pricing from an ERP or comparable system
5. Strategic products are related to the primary process via demand/supply chain system (catalogue buying, VMI)

Control

Process control

1. No control mechanisms in place
2. Taking action when the internal customer asks for it
3. Delivery date is checked (a number of days) before expiring (routine status check)
4. Progress control on the supplier's process, based on earlier defined milestones (advanced status check)
5. Automated control; supplier operates as an integrated part in the process, direct delivery to the (production) line (e.g. Kanban)

Internal performance measuring

1. Performance of the procurement function (department) is not measured
2. The procurement function is assessed according to product price savings
3. The procurement function is assessed according to product price and procurement process cost savings
4. The procurement function is assessed according to savings (product price and process costs), and internal customer satisfaction (internal Service Level Agreement)
5. The procurement function is assessed according to the complete value chain contribution

Supplier performance measuring

1. Performance is not measured
2. Performance is only measured according to logistic parameters; there is not feedback to suppliers
3. Performance is measured according to logistic parameters; regularly there is feedback to suppliers and adjustment
4. Supplier performance is measured according to the contribution to organizational goals
5. Supplier performance measurement is dedicated to improvement of the full value chain

Organization

Purchasing department

1. There is no official procurement function
2. There is a purchasing department, responsible for regular purchases of routine purchases of goods/services (indirect materials)
3. There is a purchasing department, responsible for regular purchases of routine purchases of goods/services (indirect materials) and primary goods/services (direct materials) and project based purchasing
4. There is a purchasing department, taking care of its own focus, controlling maverick buying, headcount and its own position within the organization
5. There is a purchasing department, partly responsible for business/product development and results

Staff competences

1. Strong task orientation
2. Purchasing staff has commercial attitude
3. Purchasing staff analyses cost trends and is able to communicate with suppliers credibly
4. Purchasing staff is considered as valuable force, with emphasis on

Business alignment in the procurement domain: a study of antecedents and determinants of supply chain performance

experience, motivation and attitude

5. Purchasing staff encourages (product) innovation by involving suppliers

Information

Information processing

1. Ordering information can be generated, by hand; the ordering system is not connected to the financial system
2. Information is available from reports from a system that is connected to the financial system
3. Information is automatically generated, and periodically studied
4. Information can be studied continuously, as it is available through automation, on-the-fly
5. As 4), with the addition that business intelligence information is automatically connected to e.g. supply decision support system and distributed to organization board

Management information

1. There is no generation of management information
2. The purchasing department pro-actively supplies market information to its most important internal customers
3. Supplier performance is regularly benchmarked; outcomes are used to change the purchasing tactics
4. In the strategic product groups there is insight in value creation in the supply chain (1st tier, 2nd tier, etc.) in relation to the organization's competition
5. As 4), with the addition that the purchasing department has tools and capacities at their disposal to adjust value chain performance pro-actively

Information Technology

Operational purchasing process

1. IT systems (if any) are directed towards supporting generic administrative processes
2. IT systems are directed towards the automation of transactional processes
3. An (E-)ordering system only serves to automate the internal purchasing processes
4. The (fully) automated purchasing processes are integrated the suppliers organizational processes
5. Het (fully) automated purchasing processes are integrated with the organization processes, as well as with supplier's (selling) processes (e.g. RosettaNet)

Tactical purchasing process

1. The tactical purchasing process (e.g. sourcing) runs via traditional channels (telephone, fax)
2. The tactical purchasing process runs via external information sources (internet, portals)
3. The tactical purchasing process runs via e-tendering and e-auctioning
4. The tactical procurement process is equipped with an functional contract management system
5. The tactical purchasing process partly runs via an integrated system of suppliers and customers

Procurement Performance

The answers to the following statements range from *relatively low performance* (= strongly disagree) to *relatively high performance* (= strongly agree).

Performance over time

The average time, from purchase order to delivery has decreased in the last two years

The average number of purchased items that do not measure up to the agreed quality has decreased in the last two years

The average purchase *price* of purchased items has decreased in the last two years (controlled for the influence of market forces)

The average purchase (process) *costs* per transaction for purchased items have decreased in the last two years

Competitive Performance

The average time, from purchase order to delivery is shorter compared to our main competitors

The average number of purchased items that do not measure up to the agreed quality is lower compared to our main competitors

The average purchase *price* of purchased items is lower compared to our main competitors (controlled for the influence of market forces)

The average purchase (process) *costs* per transaction for purchased items are lower compared to our main competitors

Biographical notes**Patrick Mikalef**

Patrick Mikalef is currently a Ph.D candidate at the Department of Informatics of the Ionian University, Corfu, Greece. He holds a B.Sc. in Informatics, with a specialization on Information Systems from the Ionian University, and a M.Sc. in Business Informatics from the Department of Information and Computing Sciences of Utrecht University, Utrecht, The Netherlands. His research interests include information systems management, service-oriented architectures, digital business strategies, dynamic capabilities, and social media for business.

www.shortbio.net/mikalef@ionio.gr

**Adamantia Pateli**

Adamantia G. Pateli holds the position of Assistant Professor of Information Systems at the Department of Informatics of the Ionian University, Corfu, Greece. She holds a B.Sc. Degree in Informatics (specialization in Information Systems) from the Athens University of Economics and Business (AUEB), a Masters Degree in Electronic Commerce from the University of Manchester, and a PhD degree from the Department of Management Science and Technology of the Athens University of Economics and Business (AUEB). She has published more than 40 research articles in European and international peer-reviewed conferences as well as in leading academic journals, such as Information & Management, European Journal of Information Systems, Journal of Organizational Change Management, International Journal of Technology Management, Electronic Markets, Journal of Theoretical and Applied Electronic Commerce Research, International Journal of Web Engineering and Technology, International Journal of E-Services and Mobile Applications & Management Decision. Her current research interests lie in the areas of information systems management, business models, digital entrepreneurship, and open innovation.

www.shortbio.net/pateli@ionio.gr

**Ronald Batenburg**

Dr. Ronald Batenburg obtained his masters at Utrecht University and his PhD in 1991 at Groningen University. After his PhD, he worked at the Universities of Utrecht, Tilburg and Nijmegen as assistant professor in organization science, strategic policy making and HRM. Since 2000 he is associate professor at Utrecht University, Department of Information and Computing Sciences, from 2009 on a part-time basis. As of 2009, he is programme leader at the Netherlands institute for health services research (NIVEL). His research interests and publications are in the field of organizations and labour markets, specifically in relation to IT and in the health care sector.

www.shortbio.net/r.s.batenburg@uu.nl



Rogier van de Wetering

Dr. Rogier van de Wetering is a managing consultant and researcher at Deloitte's Public Sector Practice in the Netherlands and Utrecht University. He holds both a Master's Degree from Utrecht University and a Ph.D. in Information Sciences and Medical Informatics. Rogier works with a diverse client base including Universities, Universities of Applied sciences, Academic health sciences centers, Governments and NGO's. He is active in several fields focusing on working with business executives, leaders, managers and front line staff to assess their business maturity, complexity and operations, identify improvement opportunities to enhance current benefits, both in terms of service, quality and efficiency (e.g. cost reduction), and support (IT) implementation. He has written many papers and books and published in several high regarded journals and conferences including "the Journal of Digital Imaging", "the International Journal of Medical Informatics", "International Journal of Computer Assisted Radiology and Surgery and European Conference on Information Systems. His main research program is to develop a general theory of the 'adaptive' and 'emergent' nature of information systems in organizations and the triangular construct of nonlinear dynamics of a system's maturity states, organizational alignment and system performances.

www.shortbio.net/r.vandewetering@uu.nl