Designing vendor evaluation systems: An empirical analysis

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1. Introduction

The impact of suppliers on firm performance can be quite relevant not only to costs but also to quality, time, innovation and sustainability (Carr and Pearson, 1999; Lambert et al., 1996; Cousins and Spekman, 2003; Caniato et al., 2012). As a consequence, performance measurement broadens its scope from within a company to the entire supply/value chain (Christopher, 1998; Hald and Ellegaard, 2011). At the same time, purchasing departments increase in importance, and their role evolves from transactional to strategic (Ellram and Carr, 1994; McIvor et al., 1997; Cavinato, 1999), including the active management of supply relationships (Monczka and Trent, 1995; Carter and Narasimhan, 1995), which has evolved from an arm's-length approach to more collaborative approaches (Lamming, 1993).

Competitiveness is increasingly anchored to the appropriate selection and management of a supply base (e.g., Choi and Hartley, 1996; Huang and Keskar, 2007). Choosing the right supplier among existing suppliers, finding a new supplier, monitoring supplier performance, and operating supplier development programs require mastery of an effective Vendor Evaluation System (VES). Although most purchasing and supply chain managers would agree that such knowledge is important, several firms still lack a formal and comprehensive VES (from qualification to vendor rating). Moreover, the literature does not currently provide the necessary evidence to support this practice because it primarily proposes a very high number of indicators to evaluate suppliers and more generally, very complex algorithms and mathematical models (e.g., De Boer and Van der Wegen, 2003; Narasimhan and Talluri, 2006). These methods are far from managers' actual needs (Brun and Pero, 2011), whereas clear guidelines for designing and implementing VESs are lacking (Huang and Keskar, 2007).

We structure this paper as follows: an overview of the relevant literature precedes our research questions and methodology. Next, we report our main results regarding the strategic alignment of the VES, process, execution, benefits and costs. Finally, we discuss the connection between these elements and user satisfaction to provide useful contributions for scholars and managers.

2. Literature review

The importance of vendor qualification, selection and evaluation is well recognized in the literature (Carr and Pearson, 1999; Kannan and Tan, 2002; Spina et al., 2013), along with the negative effects that an erroneous selection may cause (Carter et al., 2010). For example, the productive stream of research related to supplier development strategies (Handfield et al., 2000; Humphreys et al., 2004; Narasimhan and Jayaram, 1998; Sako, 2004; Sanchez-Rodriguez et al., 2005) acknowledges the importance of supplier evaluation (Frey and Schlosser, 1993; Galt and Dale, 1991; Krause and Scannell, 2002; Krause et al., 1998; Watts and Hahn, 1993) as a preliminary step for supplier development. In particular, Hahn et al. (1990) distinguish between narrow and passive programs

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Table 1
Selected literature review about VES.

Authors	Indicators	Methods and models[a]	Related topics
Dickson (1966)	23 relevant supplier indicators		
Wind and Robinson, (1968)		Evaluation function approach. Manage the trade-off between different supplier indicators	
Lehmann and O'Shaughnessy (1982)	Four sets of supplier indicators: performance, economic, integrative, adaptive	Supplier indicators depend upon the type of product purchased	• Portfolio management
Ellram (1990)	Four sets of additional supplier indicators: financial, organizational, technological, miscellaneous	Partner suppliers require a different set of indicators in addition to traditional ones	• Supplier relationship management
Weber and Current (1993)		Multi-objective approach to vendor selection	• Trade-off management
Swift (1995)	Five sets of supplier indicators: product, availability, dependability, experience, price	Supplier indicators depend upon the sourcing strategy (single vs. multiple sourcing)	• Supplier relationship management
Choi and Hartley (1996)	Eight sets of supplier indicators		• Supplier selection • Portfolio management (direct vs. indirect) • Supplier relationship management
Vokurka et al. (1996)	Review previous contributions about supplier indicators	Develop a prototype expert system application for the evaluation and selection of potential suppliers	
Verma and Pullman (1998)	Compare the perceived importance of different supplier indicators (Likert scales) to actual choices of managers (DCA experiment)		• Perceptual/ Behavioral issues
Ittner et al. (1999)	Ten indicators for supplier selection and monitoring		• Supplier relationship management
Degraeve et al. (2000)		Compare different supplier selection models in terms of TCO. Mathematical programming and multiple item models generate better results	
Masella and Rangone (2000)	Four sets of supplier indicators: manufacturing and technological performance and infrastructure	Vendor selection systems (VSSs) depend upon the time frame and on the strategic relevance of buyer–supplier relation. Authors propose an AHP framework to integrate different KPIs	• Supplier relationship management
De Boer et al. (2001)		Cluster different supplier selection methods according to four stages of the evaluation process: problem definition, criteria formulation, qualification, final selection	
Lee et al. (2001)		The supplier selection and management system (SSMS) is made of purchasing strategy, supplier management, and supplier selection system	• Strategic alignment • Portfolio management
Kannan and Tan (2002)	Five sets of supplier selection indicators and three sets of supplier assessment indicators. Soft, non-quantifiable criteria have a great impact on buyer performance even though normally are not measured		• Supplier selection and evaluation
Krause and Scannel (2002)		Explore the content and effect of supplier development in manufacturing and service firms	• Supplier development
Muralidharan et al. (2002)		Multi-criteria decision making model for supplier rating	• Actors involved in the evaluation process
Sarkis and Talluri (2002)		Develop a model for supplier selection and evaluation, including relevant steps, indicators (strategic, operational, tangible, and intangible), and decision-making levels	

Table 1 (*continued*)

Authors	Indicators	Methods and models[a]	Related topics
De Boer and Wan der Wegen (2003)		Develop formal decision-making models for supplier selection through an experimental study	
Humphreys (2003)	Seven sets of supplier environmental indicators: environmental costs, management competencies, image, design for env., env. management systems, env. competencies	Stages of supplier selection process for environmental criteria	• Knowledge management system supporting supplier selection
Lasch and Janker (2005)		Develop a multivariate analysis tool for managing vendor rating	
Aissaoui et al. (2007)		Scout the literature about supplier selection and propose a model of the selection process	
Huang and Keskar (2007)	Seven sets of supplier selection indicators and relative sub-indicators		• Strategic alignment
Humphreys et al. (2007)	Four sets of supplier indicators in the context of early supplier involvement: satisfaction, flexibility, risk, and confidence		• New product development
Luo et al. (2009)		Propose a model to overcome information-processing difficulties in screening a large number of potential suppliers in the early stages of the selection process, in the context of agile supply chains	• Product/Supply chain strategy
Van der Rhee et al. (2009)		Experiment based framework to manage trade-off in supplier selection	• Trade-off management
Carter et al. (2010)	Thirteen indicators for supplier selection		• Role of culture for global supplier selection
Ho et al. (2010)	List supplier indicators found in the literature. The most popular is quality	Distinguish between individual and integrated approaches for supplier selection and evaluation.	
Brun and Pero (2011)		The most popular are DEA and integrated AHP The level of supplier integration drives the choice of supplier KPIs	• Portfolio management • Supplier integration
Hald and Ellegaard (2011)		Develop a conceptual model about the design, implementation, and use of a supplier evaluation system	• Information sharing
Ordoobadi and Wang (2011)		The quality of the decision-making process increase by applying a multiple perspectives approach rather than a single model	
Caniato et al. (2012)	Six sets of supplier and purchasing KPIs according to competitive priorities: cost, time, quality, flexibility, innovation, sustainability	Purchasing performance management systems (PPMS) should be designed considering processes (i.e. tasks, roles, data collection, and implementation) as well as organizational levels (horizontal vs. vertical)	• Strategic alignment • Portfolio management
Igarashi et al. (2013)		Conceptual model for green supplier selection	• Strategic alignment

[a] The main focus here is on models describing key characteristics and design drivers of a VES. We do not focus on algorithms and mathematical models normally used to cope with different indicators. As a matter of fact we intend to focus on strategic and value adding decisions. Mathematical modeling of weights and indicators is widely explored by the operational research scholars and several literature reviews already exist.

that emphasize supplier evaluation and broader approaches that include proactive customer efforts to improve suppliers' capabilities.

However, on the one hand, companies are often incapable of properly leveraging the benefits that arise out of the evaluation process (Van der Rhee et al., 2009). On the other hand, the research still lacks an appropriate framework for suggesting to managers how to effectively design and implement a comprehensive and effective VES (Huang and Keskar, 2007).

Indeed, many studies have been conducted on the indicators (e.g., Weber et al., 1991; Wilson, 1994; Choi and Hartley, 1996; Vonderembse and Tracey, 1999; De Boer et al., 2001; Sharland et al., 2003) and methods suitable for vendor selection and evaluation (e.g., Bhutta and Huq, 2002; Muralidharan et al., 2002; Sarkis and Talluri, 2002; De Boer and Van der Wegen, 2003; Narasimhan and Talluri, 2006; Teng and Jaramillo, 2005), but few studies have been conducted on other important areas of study, such as the main design variables of a VES, the structure of the evaluation process, and the benefits and costs associated with the use of a VES (De Boer et al., 2001).

Furthermore, company requirements and research outputs seem to be somewhat misaligned because the evaluation methods normally employed by companies are far simpler than those proposed in the literature (Brun and Pero, 2011). Surprisingly, to

the best of our knowledge, VES design is at the core of very few studies, except for common purchasing and supply management textbooks (e.g., Van Weele, 2009; Monczka et al., 2010). Indeed, according to Carter et al. (2010), the VES literature can be divided into two main streams– namely, indicators and methods – that are briefly discussed later in this paper. There is little evidence related to other aspects of vendor evaluation, such as key design variables (i.e., the variables that drive system architecture), process (i.e., the stages of evaluation), system execution, and benefits and costs associated with the use of a VES.

All in all, the literature primarily addresses the issue of supplier evaluation by adopting an engineering perspective, not a managerial one. According to the engineering perspective, scholars treat supplier selection as an optimization problem (Huang and Keskar, 2007). We, however, seek to contribute to research and practice by clarifying how a VES is designed and implemented, highlighting the key decisions and actors involved.

To this end, Table 1 summarizes select contributions related to the previous VES literature, organizing the primary outcome of each study according to the two areas set forth above (i.e., indicators and methods). With respect to indicators, the literature does provide comprehensive lists used for the selection and/or assessment of suppliers, from the classical indicators of costs, quality, and flexibility to more recent indicators related to sustainability. With respect to methods, Table 1 does not include the large number of studies in the literature regarding algorithms and mathematical methods. Instead, we summarize the few studies that clarify both the primary stages of vendor evaluation and the key decisions related to VESs.

Considering this overview, certain recurring topics related to VESs emerge and allow us to draw some general conclusions. First, there is no definitive list of indicators because the set of metrics used depends on a firm's strategy and on the product or service exchanged. Designing a VES that is not connected to firm strategy (i.e., strategic alignment) is highly risky and potentially useless because it does not allow for managing tradeoffs among indicators or establishing priorities. Additionally, several studies suggest that a VES should be tailored according to the type of good or service exchanged. For example, critical items should be assessed differently than bottleneck items (referring to Kraljic's 1983 matrix). Second, a firm's ability to manage supplier relationships depends to a large extent on its ability to manage VESs. Firms should assess long-term, strategic suppliers differently than short-term, non-critical suppliers. Several studies support this view and connect VESs to practices such as supplier development or supplier integration. Finally, an effective VES requires information processing capabilities and tools. On the one hand, firms should carefully evaluate alternative software solutions for managing the vendor evaluation process. On the other hand, decisions about what information to share with whom are crucial to motivate vendors. However, there are few insights into how to embed these recommendations into a VES.

3. Research goal and framework

This study's general background is the strategic purchasing literature (Carr and Pearson, 1999; Narasimhan and Das, 2001; Chen et al., 2004; Paulraj et al., 2006). Strategic purchasing scholars show that business performance depends on the role that purchasing plays in a company's strategic planning process. Therefore, to explain business performance, it appears necessary to account for the strategic behavior of the purchasing function. In particular, Gonzalez-Benito (2007, 2010) defines the strategic planning process framework of the purchasing function as a sequence that starts with corporate strategy and then moves on to purchasing strategy, choices, implementation, and performance. That study emphasizes the importance of aligning purchasing's competitive priorities (i.e., purchasing strategy) to corporate and manufacturing priorities as a way to ensure purchasing's contribution to the business. The establishment of a VES is one of the most crucial actions that can be taken to ensure such an alignment, not only as a means of monitoring suppliers in terms of a company's key competitive priorities (e.g., Hald and Ellegaard, 2011) but also as a prerequisite and catalyst of other relevant actions, such as supplier integration (e.g., Gonzalez-Benito, 2010) and supplier development (e.g., Handfield et al., 2000; Humphreys et al., 2004; Rogers et al., 2007).

Indeed, the opportunity to improve the dyadic buyer–supplier relationship requires a firm to broaden its internally focused performance management systems (Hald and Ellegaard, 2011). Therefore, numerous papers investigate the development of performance measurement systems addressing the evaluation of activities outside company borders, including suppliers in first place (Simpson et al., 2002; Wilson, 1994). However, most research on performance measurement within or outside company borders is oriented towards the identification and development of performance measures and models (Purdy and Safayeni, 2000). As stated above, this is also true for supplier evaluation.

This study represents a shift in focus from studying the measurements themselves to how they are used in real-life situations (Elg and Kollberg, 2009) and in general, to how VESs are designed, e.g., how measures are aligned to corporate strategy, which stakeholders are responsible for collecting and analyzing data, and how supplier evaluation is executed. Understanding how supplier evaluation practices are designed, implemented, and used within and between organizations is critical for managers because it generates insights into the effective management of suppliers through performance measurement devices (Hald and Ellegaard, 2011).

The objective of this study is to explore supplier evaluation practices and their effects. More specifically, we focus on the key design choices involved in developing a VES.

Hald and Ellegaard (2011) propose three main phases of VES development: (i) design, in which key objectives are defined and performance measures are selected; (ii) implementation, in which systems and procedures are put in place to collect and process the data that enable measurements to be taken regularly, and (iii) use, in which performance data are collected, reviewed, and acted upon.

We believe that it is worth focusing on the design stage because critical and irreversible decisions are made at this stage that affect the implementation and use that follow. In fact, designing a VES consists of not only choosing appropriate performance measures for suppliers but also establishing procedures, roles, responsibilities, and tools, along with deciding how to use the data.

For this reason, we further split the VES design phase into key choices, which are also related to future implementation and use. We therefore consider three components of the VES design (see Fig. 1).

The first component is *strategic alignment*. We know that performance measurement systems must be aligned with firm strategy (Kaplan and Norton, 1992), and supplier performance measurement systems are no exception (Caniato et al., 2012). To understand how a VES is aligned to corporate and manufacturing strategy we investigate the following elements:

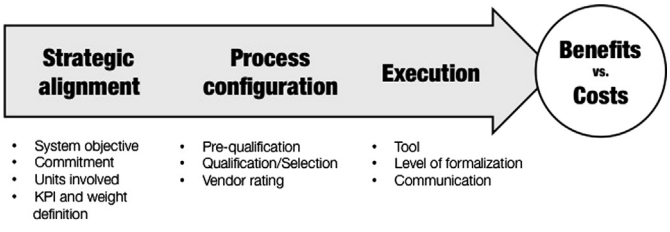

Fig. 1. Components of VES design.

- *Key performance indicator* (*KPI*) *and weight definition*. To align a VES to the key objectives of a firm's strategy, relevant KPIs and relative weights are defined (Choi and Hartley, 1996; Simpson et al., 2002; Tan et al., 2002).
- *Units involved*. Supplier evaluation is often a cross-functional affair, given that the knowledge and authority to express a judgment over different performance dimensions lies within different functions (Kannan and Tan, 2002; Foerstl et al., 2013).
- *Commitment*. The level of strategic alignment is generally associated with the commitment of top management (Pohl and Forstl, 2011).
- *System objective*. It is important to know whether strategic alignment is an explicit objective of vendor evaluation or whether there are other reasons behind the implementation of a VES (Caniato et al., 2012).

The second component is *process configuration*. Since the early studies defining it, supplier evaluation has been considered "the process of quantifying the efficiency and effectiveness of supplier action" (Neely et al., 1995). The literature on the process phases is scarce but consistent. The process is described as composed of three main, well-separated phases, all of which are objects of our investigation:

- *Prequalification*. This phase involves choosing a limited number of potential suppliers from among existing firms (Koppelmann, 2000) by analyzing their economic, technical, and environmental performance (Hartmann et al., 1997), which is necessary to increase the efficiency of the next phase (Lasch and Janker, 2005).
- *Qualification/selection*. This phase involves a systematic evaluation of potential vendor characteristics, which allows a firm to choose one (or more) (Webster and Wind, 1972; Chen, 2011).
- *Vendor rating*. This phase involves the regular control of the performance of active suppliers' (Lasch and Janker, 2005; Large, 2000; Sencer Erdem and Gocen, 2012).

The third and final component is *execution*. This component focuses on methods and tools used to implement a VES, including the following:

- *Tool*. Empirical evidence shows that the efficient and effective implementation of a VES requires appropriate tools, ranging from simple spreadsheets to more complex, integrated ICT solutions (e.g., Martin et al. 2011; Huseby et al., 2012).
- *Level of formalization*. In connection with the previous element, the formalization of procedures or tools used to collect and review data about a supplier is expected to determine the correct use of a VES, as for any other performance measurement system (Prahinski and Benton, 2004).
- *Communication*. The literature also emphasizes the importance of deciding what should be communicated to suppliers that may influence their actions (Cousins et al., 2008; Dumond, 1994; Prahinski and Benton, 2004; Prahinski and Fan, 2007; Purdy et al., 1994).

With respect to the benefits connected to VESs, the literature primarily associates VESs with opportunities to influence suppliers' behaviors. The underlying assumption is that if such an influence is successful, it will manifest itself in changed supplier behavior that is aligned with the company's interests, along with improved supplier capabilities and performance, which in turn will benefit the buying company (Prahinski and Benton, 2004). As a result, VES benefits include better performance (Prajogo et al., 2012) in terms of profitability, product quality, and vendor performance (Ittner et al., 1999; Giunipero, 1990) along with proper supply chain monitoring (Choi and Hartley, 1996), influencing suppliers' behavior (Hald and Ellegaard, 2011), and improved buyer–supplier relationships (Kannan and Tan, 2006; Carr and Pearson, 1999). As anticipated, we seek to understand whether other types of benefits arise out of VESs and whether those benefits are sufficient to counterbalance VES-related costs. Furthermore, we seek a connection between VES design choices and the resulting benefits, which can be of great interest to managers.

Consequently, this study's objectives are twofold. First, we have an exploratory goal, i.e., we aim to identify the relevant variables regarding VES strategic alignment, process, and execution, and how they are deployed by leading firms. We detail this first objective in RQ 1, below. Second, we have an explanatory objective, i.e., we aim to understand whether and how a different configuration of the previously identified variables leads to different user satisfaction in terms of the benefits and costs of a VES. This objective is detailed in RQ 2.

RQ1. How can a VES be designed?

- *RQ1.1*: *How is a VES strategically aligned?* We want to understand the origin of the commitment for a VES development, which organizational units are involved, and how the choice of supplier KPIs is aligned with corporate strategy.
- *RQ1.2*: *How is the VES process configured?* We want to understand which supplier evaluation stages are implemented and who is in charge of each stage.
- *RQ1.3*: *How is a VES executed?* We want to investigate the key choices related to the actual use of a VES that should be made in advance to ensure its proper function.
- *RQ1.4*: *What are the VES benefits and costs?* We want to investigate which specific VES benefits are actually achieved by implementing companies as well as the related costs.

RQ2. How does the VES design influence firm satisfaction with the system?

We aim to understand which combination of a VES's strategic alignment, process and execution allows a higher level of satisfaction in terms of benefits achieved and costs sustained.

4. Methodology

As discussed above, the VES literature is extensive in some areas but incomplete in others. Because our objective is to support managers in designing VESs, we used multiple case studies with a theory-building intent to investigate how and why vendor evaluation is conducted (Wacker, 1998). Case study methodology seemed appropriate because we focused on those structural and executive characteristics of VES that are not well identified in the literature. We therefore consider this stream of research to be in its early stages (Eisenhardt, 1989), possibly leading to new insights (Voss et al., 2002). The roadmap used for this case study research was borrowed from Voss et al. (2002).

4.1. Sample

Multiple case studies were conducted to improve external validity and help guard against observer bias. However, multiple case studies limit the depth of the analysis on single cases (Voss et al., 2002). The unit of analysis for this study was the VES already in place at each studied firm. In most cases, there was a one-to-one relationship between the company/business unit, but in some cases, different systems were in place for different purchasing categories (e.g., direct and indirect purchases). Following Yin's recommendations (2003), we selected ten companies using VESs for a total of thirteen analyzed VESs. We used a mixed replication logic. Indeed, companies in the sample had different features (theoretical replication), belonged to diverse industries and were

Table 2
Sample characteristics (company size, industry and people interviewed).

Industry	Company	Sales (mil €)	Spending (mil €)	EBIT (mil €)	Employees	CPO reports to (level)	Coverage (%)	# Category families	# Suppliers	VES age	Informants
Automotive	Auto1	1254	650	73	5900	CEO (1)	95	6	700[a]	10	Two VES project leaders
	Auto2 (direct)[b]	90	41	N.A.	500	CFO (2)	100	3	100	5	Head of direct purchasing
	Auto2 (indirect)		15			CFO (2)	100	14	400	1	Head of indirect purchasing
Energy	Energy1	12,000	545[c]	2	4000	CIO (2)	97	554	3100	3	Project engineer System designer
	Energy2	536	270	N.A.	5271	BU CEO (1)	98	Hundreds	1500	3	Supply base manager Buyer
Electric	Electric1	860	448.8	213	3400	CEO (1)	82	379	1330	20	CPO Category manager
	Electric2	884	492	N.A.	5271	BU CEO (1)	98	Hundreds	1000	3	CPO Head of quality, safety& env.
Fashion	Fashion1	2100	N.A.	494	11,000	BU CEO (1)	100	34	650[a]	10[d]	CPO shirts and neckwear BU
	Fashion2 (direct)	6222	381	807	60,000	COO (2)	100	6	1000	2	Two VES project leaders Indirect purchasing manager
	Fashion2 (indirect)		990			CFO (2)	100	4	1,500[e]	2	
White goods	White1 (direct)	3200	1200	N.A.	12,000	Area CEO (1)	100	238	1000	9	Head of purchasing quality Indirect purchasing analyst
	White1 (indirect)		566			Country Plant	94	10	9588		
	White2	950	600	9.3	6000	CEO (1)	75	3	828[a]	0	Head of supply chain and VES project leader

[a] Only for direct goods/services.
[b] The system used by the Auto2 subsidiary interviewed is similar to the one used across all the automotive division.
[c] This data does not include gas purchases (8500 mln €) that are part of framework contracts not managed by the purchasing department.
[d] Vendor evaluation is in place since many years, vendor qualification since 1 year.
[e] Only for Europe.

characterized by the different nature of their purchases. That notwithstanding, the studied companies had some similarities (literal replication) because two companies per industry were analyzed, and all of the studied firms were large. More specifically, the sampled companies share the following characteristics:

- They belong to the manufacturing sector, for which the strategic and economic value of purchases is generally higher and more established compared to the service sector. We expect a high purchasing to turnover ratio. Therefore, we assume the emphasis on vendor evaluation to be stronger.
- They are large (in terms of both sales and employees) because large size ensures the presence of a formal VES.
- They are focal companies, i.e., they produce a finished, complex product by assembling a large number of parts and components supplied by a large network of suppliers. Accordingly, these companies manage a complex purchasing portfolio in terms of the number and complexity of items purchased.

The sample is described in Table 2. The target respondents belonged to the department (typically purchasing) in charge of vendor selection and evaluation and/or were responsible for their firms' VES design. The age of the corresponding VES was calculated since its most recent major change or update (the older the system, the more it was established and consolidated). We focused our analysis on current VES characteristics, even though in most cases, we also benefitted from the contribution of key informants who had been at the company for several years and witnessed the system's evolution over time.

4.2. Interview protocol

A semi-structured interview protocol was used (Eisenhardt, 1989). Given that vendor evaluation capabilities varied across the sample, the semi-structured protocol allowed us to focus on what was unique at each company. When possible, we used concepts and variables with some theoretical underpinning. The protocol was divided into four main parts (which normally mirrored the structure of the interview):

- General information about the company, its business context, and its purchasing department;
- A description of the company's vendor qualification, selection and evaluation processes;
- Information about organizational roles, responsibilities, and key design variables; and
- Perceived benefits and costs

The general structure of the interview (which was shared in advance with key informants) and the detailed checklist (which was not shared) used by the research team during case studies are shown in Appendix.

4.3. Data collection

The interviews lasted between 60 and 120 min. They were generally conducted on-site, although a few were conducted via telephone. The interviews were taped so that after each site visit, we were able to produce transcripts and check field notes for accuracy. After the first interviews, any new or interesting areas that had arisen were added to the protocol for future visits. The interview instrument was updated and improved throughout each replication until no additional changes were necessary, which is a foundation of grounded theory development (Glasser and Strauss, 1967). When necessary, follow-up meetings, calls, and e-mails were used to obtain all of the required information. To ensure triangulation, we collected data from different respondents, official and internal company reports, and archival sources.

4.4. Coding and analysis

Coding was performed after the last interview. Once the data collection was complete, coding was accomplished via a multistep iterative process aimed at capturing the relevant information in

the most effective and efficient way. The literature review was instrumental in organizing the dataset. The coding instrument consisted of a series of variables related to the VES design and its related potential benefits. In addition, a qualitative scale to assess each coding variable was developed. Variables and scales were largely grounded in the literature and were partially derived from the researchers' experience and field evidence. All of the coding variables and outcomes that are relevant to our research questions are reported in the results sections.

The coding structure obtained at the end of the process was leveraged to provide a synthetic account of each case study. Between two and four independent researchers coded each single case using a codebook that was defined before data collection and refined during the process.

The data analysis had two main components: within- and cross-case. The former component was used to enhance the knowledge of each single case independently, thus allowing specific patterns and relationships to emerge. The results were validated via a comparison with the other cases – i.e., cross-case analysis (Eisenhardt, 1989). As in the coding phase, four researchers openly discussed case analysis and contributed to the interpretation of the results. This allowed for a further refining of the coding scheme, solving disagreements, and arriving at a unanimous interpretation of the data collected.

5. Results

In this section, we present an overview of the main results according to the research questions presented above. The first research question is exploratory. Therefore, the results are directly discussed by looking at the variables used in our coding scheme. The second research question is more explanatory in nature. Therefore, we dedicate the discussion section to the second research question.

5.1. VES strategic alignment

To answer our first research question, we coded a set of variables that dealt with the key characteristics of a VES to ensure its alignment with firm strategy. In particular, we looked at: commitment, organizational units involved, VES objectives, KPI definition criteria, and weight definition criteria. The only variable resulting as non-differential across the sample is the criterion used to choose KPIs. Indeed, all of the companies in the sample declared that their choice of KPIs was driven by their alignment with the corporate and functional strategies. Therefore, we do not report such variables, whereas all of the other variables are shown in Table 3 and described hereafter.

Commitment. Cases confirm that the commitment of top management is considered critical to the success of a project (i.e., Eccles, 1991) because executives or CPOs are always among the sponsors. This reflects two possible perspectives: that of top management, which wants to keep the purchasing function under control and that of the purchasing department, which is willing to support its own role in the company.

Units involved in VES design/execution. Cases show the cross-functional nature of the process, as it requires contributions from several departments in addition to purchasing (e.g., Sarkis and Talluri, 2002), such as quality and engineering. In several cases, the internal customer also has an active role in designing the VES. When considering direct purchases, the operations department usually represents the internal customer, whereas for indirect purchases, other departments are involved (such as marketing, HR or IT). In this situation, the purchasing department requires good skills in terms of both project management (when the VES is under development) and process management (when the VES goes live). In particular, all cases show the necessity for the purchasing department to integrate different views into a compelling process structure and to moderate internal negotiations regarding key decisions, such as the choice of KPIs and relative weights, the steps of the evaluation process, the responsibilities of each step and the sources of data. For this reason, it is extremely important for the effectiveness of the VES to involve all key stakeholders. Whereas some companies are aware of the need to establish a cross-functional process, others tend to limit the number of departments involved.

Table 3
VES strategic alignment.

Company	Commitment	Units involved (in design and execution, beside purchasing)	System objective	KPI definition	Weight definition
Electric1	CPO	Finance, Logistics, Manufacturing, Quality	Supply base reduction	Shared, integrated by purchasing	Purchasing, driven by strategy
Electric2	Top-management	Quality, Safety&Env.	Process standardization	Shared	Shared, driven by consensus
Energy2	Top-management	Engineering, Quality, Safety&Env.,	Process standardization	Purchasing	N.A., driven by strategy
Energy1	CIO, CPO	Engineering, Finance, Internal customer, IT, Safety&Env.	System integration in ERP	Purchasing	Shared, driven by consensus
Fashion2	CPO	Engineering, Planning, Quality	Process standardization	Independent	Shared, driven by consensus
Fashion1	Top-management	Logistics, Quality, Style	Transparency, Supplier scouting	Shared, integrated by purchasing	Purchasing, driven by strategy
White1	Top-management	Finance, Manufacturing, Quality	Corporate strategy alignment	Independent, not integrated	–
White2	CPO	Backoffice, Engineering, IT, Quality	Control, Objectivity	Independent, integrated by Purchasing	Shared, driven by category type
Auto1	CPO	Engineering, Internal customer, Logistics, Quality	Strategic alignment, Supplier development	Independent, integrated by Purchasing	Shared, driven by strategy
Auto2	Top-management	Quality	Supplier performance improvement	Purchasing	Shared, driven by consensus
Fashion2 indirect	CPO	Internal customer	Process standardization	Purchasing	Purchasing, no specific criterion
Auto2 indirect	Top-management	Internal customer, Top-management	Process standardization	Shared	Shared, driven by consensus
White1 indirect	Top-management	Internal customer	Process standardization	Purchasing	–

System objective. This variable answers the reason for designing the system. The reasons reported are various and sometimes misaligned with the benefits actually obtained, suggesting that when companies design a system, they are not fully aware of the benefits of vendor evaluation. For example, Fashion2 declared that process standardization was its system objective, but suppliers' performance improvement emerged as the actual benefit. In line with the literature (e.g., Cusumano and Takeishi, 1991), we can say that strategic reasons (such as strategy alignment) drive all firms (except for Energy1) to build a VES. We also find other motivations, such as process standardization (e.g., Fashion2, Auto2, Electric2, Energy2), transparency (e.g., Fashion1) or supply base reduction (e.g., Electric1). In general, we observed companies that designed and implemented VESs as a consequence of larger projects of business process reengineering, aiming both to define formal procedures and to support the vendor management process (i.e., process standardization). Other companies explicitly defined their VES objectives upfront, showing a clear intention with respect to leveraging the system.

KPI definition. This variable indicates how organizational units are involved in identifying indicators. Case studies show three possible outcomes:

- Shared design, in cases in which all of the units involved in the vendor evaluation collectively designed the indicators. For example, in Electric2, the purchasing and quality department jointly defined suppliers' KPIs. In some cases, the purchasing department clearly acted as a process owner and worked to translate ideas from other departments into actual indicators and/or to integrate all indicators into a comprehensive system.
- Independent, in cases in which each unit independently designed evaluation indicators related to their areas of expertise (e.g., the quality department established quality indicators). For example, Fashion2 entrusted four different departments (i.e., purchasing, quality, planning, and engineering) with defining

Table 4
VES process configuration.

Company	Pre-qualification[a]		Qualification/Selection[a]			Vendor rating[a]
	RfO	*Questionnaire(s)*	*Product* & *process quality*	*Technical* & *Economic*	*Negotiation* & *budget split*	
Electric1		Purchasing, Finance	Purchasing, Quality		Purchasing, Internal customer	Purchasing, Logistics, Quality
Electric2	Purchasing	Automatic	Purchasing, Engineering, Quality		Purchasing	Purchasing, Quality
Energy2	Purchasing	Automatic	Purchasing, Engineering, Quality	Purchasing, Engineering		Purchasing, Engineering, Quality
Energy1		Purchasing Engineering, Internal customer, Safety&Env.		Purchasing, Engineering		Purchasing, Engineering, Internal, customer, Safety&Env.
Fashion2		Purchasing	Purchasing Quality, Engineering, Planning		Purchasing	Purchasing, Engineering, Quality, Planning
Fashion1	Purchasing, Quality, Style	Purchasing, Engineering, Operations	Purchasing, Engineering, Operations, Quality		Purchasing	Purchasing, Logistics, Quality Style
White1		Purchasing	Quality		Purchasing	Finance, Manufacturing, Quality,
White2	Purchasing	Purchasing	Purchasing, Quality, Engineering		Purchasing	Purchasing, Back-office Quality
Auto1	Purchasing	Purchasing, Finance Quality	Purchasing, Engineering, Quality		Purchasing	Purchasing, Logistics, Quality
Auto2	Purchasing	Purchasing	Purchasing, Quality		Purchasing	Purchasing, Logistics, Quality
Fashion2 indirect		Automatic			Purchasing, Internal customer	Internal customer
Auto2 indirect	Purchasing				Purchasing	Purchasing, Accounting, Internal customer
White1 indirect	Purchasing	Purchasing, Internal customer				

[a] Dark cells indicate sub-processes that are customized according to the type of category purchased.

and measuring four sets of indicators. As in the previous case, the purchasing department might have integrated different views.
- Purchasing, in cases in which the purchasing department alone was in charge of indicator design (e.g., Energy2, Energy1).

As anticipated, the sampled companies confirmed that strategic alignment was the most common guiding principle for the choice of KPIs (e.g., Lasch and Janker, 2005; De Boer et al., 2001; Huang and Keskar, 2007).

Weight definition. This variable refers to the departments in charge of defining weights for different KPIs (usually companies adopt a weighted average system) and the criterion guiding this choice. The decision about weights is normally:

- Shared, in cases involving a collective decision involving several units (e.g., Energy1, Auto1);
- Purchasing-driven, in cases in which a purchasing department was in charge (e.g., Electric1).

We did not exclude the case in which weights were inherited from company headquarters, such as KPIs, even though we did not find this occurrence in the sample. On the contrary, it seems unlikely that each department participating in the evaluation process independently defined weights, given that this choice by definition would require finding a balance between different sets of indicators. Such balance can be found by looking at:

- Strategy (Hedderich et al., 2005; Lasch and Janker, 2005), i.e., assigning higher weights to competitive priorities important to the company; and
- Consensus (Muralidharan et al., 2001), i.e., avoiding conflicts among different departments.

Indeed, we find that in several cases the weight of each KPI is simply the inverse of the number of synthetic KPIs. For example, 25% is the weight assigned to KPIs provided by four departments. This solution ensures fair representation of all of the departments involved in the vendor evaluation but is not necessarily in line with the company's competitive priorities or the characteristics of the purchase.

5.2. Vendor evaluation process

In addition to the aspects described so far, another important aspect of VES design is process configuration. In particular, we focus on three main elements: the common steps of vendor evaluation, the organizational units involved in each step and to what extent each step is customized according to the type of purchase (see Table 4).

Despite slightly different names assigned to each steps of the vendor evaluation process by different company procedures and informal labels used by employees, VESs in the sample clearly show six main stages that can be grouped into the three main sub-processes: (i) prequalification, i.e., the collection of preliminary and general information about the supplier firm; (ii) qualification and selection, i.e., the collection of in-depth information (through documents and company visits) about the supplier product or service, enabling supplier selection, negotiation of conditions and a split of purchase volumes across multiple suppliers (if applicable); and (iii) vendor rating, i.e., the comprehensive and continuous evaluation of supplier performance in terms of products and services delivered.

As Electric2's CPO clearly expressed, it is possible to distinguish between the “evaluation of the supplier” and the “evaluation of the supply”. The former refers to the collection of overall data about a firm that is delivering a certain good, whereas the latter refers to a specific evaluation of the products and services supplied. In general, the prequalification phase aims at qualifying a supplier firm, whereas the qualification phase aims at qualifying its product. However, in some cases (e.g., Fashion1, Energy1), we find two questionnaires used for prequalification: one targeting supplier firms and the other targeting products.

Indeed, almost every firm sought to replicate the qualification process for each supplier-product pair, meaning that a supplier that is already active for a given product but is willing to be a candidate to supply a different product must pass through the qualification process, assuming that prequalification has already been achieved.

Furthermore, we observe several process variants according to the characteristics of purchasing categories. For example, the first steps of prequalification are generally standard, whereas subsequent steps are customized for specific sets of categories. For example, Electric1 performed the same phases of vendor evaluation across all categories, even though the level of detail for each phase was tailored accordingly. Categories that have a relevant effect on the cost and quality of the end product (i.e., categories that are strategically important for the firm purchasing portfolio, Luzzini et al., 2012) require suppliers to provide not only information but also performance measures. According to Electric1's CPO, categories that carry a relatively higher level of risk for the company also require a customized VES.

The steps immediately following the prequalification can consist of either qualification, selection or both. Despite our expectation that a defined selection phase would be required, we find that many firms do not always select suppliers through auctions or tenders. Such firms do not even create short lists of suppliers through prequalification from which they then choose suppliers. In many cases, suppliers have been chosen from the beginning of the process, and they need only to pass through different stages of evaluation to be formally approved. This is mostly because many firms already have a large supply base and do not feel the need to actively scout new suppliers or to allow passive scouting (i.e., self-proposal by suppliers) through vendor portals. Some firms (such as Electric1) have grown as a result of mergers and acquisitions, thus acquiring other firms' supply bases. As a result, these firms must narrow their supply bases and select the best suppliers instead of finding new ones. Other firms have a relatively stable supply base that operates on a continuous basis. Therefore, the most relevant phase is the final one– i.e., vendor rating.

5.2.1. Prequalification

This phase aims at collecting general information about a supplier firm. Most of the firms in the sample clearly distinguished between a preliminary request for offer (RfO) and one or more follow-up questionnaires. Despite some slight variations in the content of these activities, the cross-case analysis shows a relative homogeneity throughout the sample.

Through the *RfO*, the buying firm collects general data about the supplier regarding its assets and its financial and economic stability, along with its primary technical capabilities, and assigns a preliminary evaluation using a traffic-light system. The “green” or “A” class includes suppliers who satisfy all criteria and do not represent a source of risk. The “yellow” or “B” class includes suppliers who are not fully in line with requirements and require further investigation. The “red” or “C” class typically includes suppliers that are excluded from the later stages and are unlikely to be used. Instead, green and yellow suppliers are candidates to become part of the company's supply base.

Along with general information, the RfO collects the first economic offer to check the range of prices.

Depending on the level of detail in the following steps and the possibility for a supplier to autonomously propose itself through

the buying firm's website (i.e., passive scouting), some firms in the sample (such as Electric2) use the RfO to narrow down the number of potential suppliers, thus reducing the firm's workload in the next stages. Other firms do not even allow passive scouting: Electric1 and Fashion2 already have large supply bases and are working to reduce active suppliers. The process of active scouting can only be initiated by a formal request from the buyer or internal customer, which is usually looking for new products and technologies or cost-saving opportunities. The request is first examined by the department head and then, by the individual responsible for the supply market. In case of a positive evaluation, the workflow proceeds with the approval of the CPO and the CFO.

After the RfO, one or more *questionnaires* are used to assess the supplier in more detail. Fashion1 uses two questionnaires: the first focuses on the supplier at the firm or group level and is submitted to company headquarters for approval by the quality and style departments. In the event of positive feedback, a second questionnaire focuses on the specific product or service offered, including an assessment of technical capabilities (e.g., skills, certifications, creativity, assets and technologies, and quality management) and operations (e.g., products, production capacity, lead time, production planning, and warehouse management). Again, in the event that the engineering and operations departments approve, the supplier moves on to the next stage (see below). Prequalification is usually updated every 1–3 years.

5.2.2. Qualification/selection

At this stage of the evaluation, suppliers that have survived the prequalification are assessed in terms of product and process quality through product sampling and/or company visits. Following the previous example, Fashion1 first controls product samples for conformance quality and the absence of toxic substances. Second, a team from the purchasing department evaluates supplier plants, production processes, and quality management systems through field visits. Third, the supplier is invited to meet a purchasing representative to discuss contractual arrangements. Fourth, compliance with social standards related to workers' rights and conditions is assessed by an external organization for European suppliers and an internal team for Asian suppliers. Finally, external consultants who specifically focus on country risks conduct a supplier risk assessment. In some cases, prior to final approval, the supplier receives a test order to check its capability to timely deliver the correct volume of product with the required quality.

Other firms share a similar approach to qualification: White2, for instance, sends a cross-functional team to suppliers' plants (joined by purchasing, engineering, and quality representatives) to rate the suppliers from multiple perspectives and elaborate a synthetic judgment.

Next, the supplier officially becomes part of the company supply base and orders are placed. Further negotiations may occur, leading to each supplier being assigned a share of the company's total purchase volume (which is 100% in the case of single sourcing).

Despite the fact that the formal procedure summarized in Table 4 is the norm, urgent situations sometimes lead companies to purchase products from suppliers that have not yet completed all of the qualification and selection stages. This exception exists for almost every firm in the sample and represents a risk that is normally considered less relevant than the opportunity costs associated with a lost sale.

Companies operating in a project setting, such as Energy2 and Energy1, which deliver production plants and power plants, respectively, are a partial exception to the process described above. Indeed, those companies undertake an additional phase between the product and process quality assessment and the budget split. After the supplier is qualified, it is invited to participate in a tender and to submit a technical and commercial offer. The engineering department evaluates the former, whereas the purchasing department evaluates the latter.

5.2.3. Vendor rating

The usual phase of vendor rating closes the vendor evaluation process. Only those suppliers that are qualified and receive actual orders are assessed through several KPIs. Typically, vendor rating focuses on quality (including conformity to specifications, open claims, and responses to claims), service level (including lead times, timeliness, reliability of product quantity and formats, and flexibility), and documentation (e.g., Electric1, White2). Several company departments (e.g., quality, purchasing, supply chain, finance and accounting) contribute their own expertise. Usually, but not always, different KPIs are homogenized through a set of weights (as discussed above) to obtain a synthetic score for each supplier.

Auto1 uses the economic evaluation obtained during the qualification and vendor rating to assign a share of orders to a given supplier. The *Supplier Rating System* (*SRS*) – as the company's term – is structured and updated monthly. Most companies show the same attention to vendor rating, setting the update frequency every 1–12 months, depending on the criticality of the supplier.

Auto1 adopts the following sets of indicators for direct suppliers:

- *Commercial*, including productivity, payment terms, availability of low-cost country production, and cost-saving opportunities (all indicators are given the same weight);
- *Logistics*, including reliability of times and quantities, flexibility, reactivity, and the opportunity costs of poor performance (all indicators are given the same weight); and

Table 5
VES execution.

Variable	Tool	Formalisation	Communication (of indicators and results)
Electric1	Not integrated platforms	High	Both
Electric2	Specific software module (low integration)	High	Both
Energy2	Specific software module (low integration)	High	Neither
Energy1	SAP SRM	Medium	Neither
Fashion2	Vendor portal (Ariba)	Medium	Both
Fashion1	SAP SRM	High	Both
White1	SAP, Not integrated platforms	Medium	Neither
White2	Vendor portal	High	Both
Auto1	Vendor portal	High	Both
Auto2	Not integrated platforms	High	Both
Fashion2 indirect	Vendor portal (Ariba)	High	Results only
Auto2 indirect	Not integrated platforms	High	Neither
White1 indirect	Not integrated platforms	Low	Neither

- *Quality*, including input quality (in ppm), share of approved samples on the first attempt, and opportunity costs of bad performance (all indicators are given the same weight).

Each set leads to a score between 0 and 100, which is maintained separately. The three scores are summed to obtain the SRS index on a scale of 300. In this way, suppliers are classified as: green (221–300), i.e., preferential suppliers that are likely to obtain new orders; yellow (120–220), i.e., suppliers that have shown some problems in a single area and need to develop improvement plans; and red (0–119), i.e., suppliers that have shown some problems in all areas and need consistent improvement plans. In addition to specific improvement plans regarding problematic areas, each supplier is assigned targets in each area to reach in a given time. The final score reflects the gap between the target and the supplier's actual results.

Taking specific actions against a supplier as a consequence of its vendor rating is a common practice in the companies analyzed. However, this practice usually consists of additional requirements and pressure on the supplier rather than proactive engagement in development programs.

Other companies share Auto1's approach. For example, Fashion1 conducts its ongoing vendor rating every 6 months for shirts and every year for ties, and reviews several types of operational performance (i.e., social compliance, risk, cost, quality, delivery, and service level). Interestingly, the company also classifies vendors according to longer time dimensions (such as strategic importance, creativity, new product development speed, and supply risk) that are not necessarily related to operational performance within the contract framework. These indicators are crossed with the vendor rating to analyze the portfolio of vendors on a two-by-two matrix.

5.3. VES execution

After understanding how a VES can be designed in terms of strategic alignment and evaluation processes, it is important to know how its execution is designed. To this end, we coded the following set of variables: system ownership, supporting tools, level of formalization, and communication of indicators and results to suppliers. All cases show purchasing departments managing the VES. This finding is consistent with the strategic purchasing literature (e.g., Reck and Long, 1988), which assumes that when purchasing has good standing in a company, that division is commonly the process owner for vendor evaluation. White1 entrusts a specific unit of sourcing quality, but that unit still reports to the CPO. For this reason, we do not report system ownership as a relevant variable for cross-case analysis. The other variables are shown in Table 5 and described hereafter.

Supporting tool. Technology is crucial for the success of a VES (Meekings, 1995) because among other things, it enables easier information sharing and communication (Nudurupati et al., 2011). We find three types of tools that support vendor evaluation:

- Non-integrated platforms (e.g., self-standing Excel spreadsheets), which often are used to support a subset of vendor evaluation. Information updates and communication are more difficult and integration with the company information system/ERP is absent.
- ERP modules (e.g., SAP SRM), which enable more functionalities (even though it is difficult to customize and adapt them to specific vendor evaluation needs) and are easily integrated with overall ERP.
- Dedicated vendor portals (e.g., Ariba), which offer the opportunity to tailor the system to specific evaluation needs but require some effort to integrate into the ERP.

Table 6
Benefits achieved through the VES.

	Frequency (out of 13)	Electric1	Electric2	Energy2	Energy1	Fashion2	Fashion1	White1	White2	Auto1	Auto2	Fashion2 indirect	Auto2 indirect	White1 indirect
Knowledge														
Knowledge increase	13	X	X	X	X	X	X	X	X	X	X	X	X	X
Relationship														
Improved internal relationships	11	X	X	X	X	X	X		X	X		X	X	X
Improved external relationships	5	X					X		X	X			X	
Improved reputation	1			X										
Performance														
Improved suppliers' performance	8	X	X	X		X	X		X	X	X			
Negotiation tool	8	X	X	X		X	X	X	X		X			
Efficiency														
Complexity reduction	6		X	X	X		X	X					X	
Process standardization	5	X			X				X	X		X		
Supply base reduction	4	X					X	X			X			
Passive scouting	3		X	X						X				
Effectiveness														
Process control and centralization	5	X			X	X			X	X	X	X		
Increased objectivity	5	X					X		X	X			X	
Strategy alignment	3						X	X						X
Information shared	1				X									
Overall satisfaction (out of 13)														
		9 Hi	6 Me	7 Me	6 Me	5 Lo	9 Hi	5 Lo	8 Hi	8 Hi	4 Lo	5 Lo	5 Lo	3 Lo

Table 7
Costs associated to the VES.

	Frequency (out of 13)	Electric1	Electric2	Energy2	Energy1	Fashion2	Fashion1	White1	White2	Auto1	Auto2	Fashion2 indirect	Auto2 indirect	White1 indirect
OPEX														
FTE	12	X	X	X	X	X	X	X	X	X	X		X	X
Management and control	2	X						X						
CAPEX														
Tool	6		X	X		X			X	X		X		
Organization														
Supplier resistance	3				X		X	X				X		
Organizational inertia	3				X			X						X
Overall cost (out of 5)		2	2	2	3	2	2	4	2	2	1	2	1	2
		Lo	Lo	Lo	Me	Lo	Lo	Hi	Lo	Lo	Lo	Lo	Lo	Lo

Level of formalization. This variable takes into account, on a three-level scale, how strictly procedures are defined and followed. All of the companies share medium-high levels of formalization. However, we observe that in some cases (e.g., Fashion2 and Fashion1), despite the fact that the procedures are defined, they are rarely followed, and exceptions are allowed (e.g., Energy1). In addition (e.g., White1), procedures sometimes involve different roles at different stages without a process owner actually in place.

Communication to suppliers of indicators and results. This variable reflects the designer's choice to disclose (or not) to suppliers the evaluation parameters (i.e., "indicators only"), the score obtained (i.e., "results only"), "both" or "neither". Despite these choices exerting motivational impacts (e.g., Rogers et al., 2007), sometimes companies are unwilling to disclose the information.

5.4. VES benefits and costs

Finally, we investigated the benefits and costs associated with a VES that influence the level of satisfaction of the company using it. We consider the user's level of satisfaction as a proxy for the performance of a VES, even though this might be considered a limitation of this study. Further research may extensively test the results achieved through a VES.

Table 6 shows benefits as reported by interviewees: frequency indicates how many companies in the sample mentioned each benefit. Given the qualitative nature of the study, this figure is not intended to represent a statistic, but rather to highlight the level of agreement within the sample. Most of the statistics are relatively straightforward, whereas some should be described. A structured VES enables the extensive monitoring of a wide supply base, which is otherwise impractical because of the unmanageable amount of data. Therefore, VESs are a key determinant in reducing the complexity of supply base management. Passive scouting means that suppliers can autonomously apply to enter the supply base. This can reduce the time and effort that buyers normally devote to vendor scouting but also may result in an additional workload to evaluate such requests. Finally, interviewees also note that both customers and suppliers appreciate a structured and objective VES, which improves the company's reputation. For example, a manager from Energy2 observed that the VES is used to gain customers' trust and appreciation, derived from the capability of maintaining control over the entire supply chain. This is especially true in relation to important and emerging performance areas, such as sustainability.

Furthermore, we are able to group the reported benefits into four categories. First, the use of a VES can improve relationships with suppliers – as found in the literature. However, a VES can also be instrumental in the enhancement of all supply chain relationships, both upstream and downstream, as well as within a company. Data with higher transparency and objectivity play a crucial role in determining these improvements. Second, the monitoring of vendor performance can be exploited for continuous improvement or leveraged in the negotiation stage, leading to improved business and supplier performance. Managers are sometimes doubtful of sharing information with suppliers that may influence their relative bargaining power, but most interviewees said they shared (to some extent) their VES output and that doing so improved supplier performance. Third, the system may enhance process efficiency through process control, standardization, and lead-time reduction (due to passive scouting and supply base reduction). For example, Electric1, Energy1, and White1 acknowledged as a major advantage of the system the possibility for buyers to save time and then dedicate that time to value-adding activities. The supply base reduction has other potential advantages, such as increasing the effectiveness of supplier selection thanks to the increased time available for evaluating each supplier. It can also enhance cost or service level performance thanks to volume aggregation in fewer suppliers. However, the respondents primarily emphasized process efficiency as the main benefit of supply base reduction, suggesting that process efficiency is both more immediate and more relevant. Fourth, the system enables greater effectiveness of the evaluation process through strategy alignment (target sharing), shared information (improved communication), and complexity reduction. The only benefit that has virtually no linkage to any category is knowledge increase. All of the studied companies said that this advantage is obtained through VESs. We believe that increased knowledge is at the heart of all other benefits in the sense that it is not a benefit per se but rather, is a prerequisite to achieving actual benefits.

The sample shows companies willing to exploit their knowledge increase primarily to improve efficiency (e.g., Energy1 and White1), others primarily focusing on supply chain relationships (e.g., Auto1), others interested in suppliers' performance (e.g., Electric2 and Fashion2), and finally, others willing to achieve multiple objectives concurrently (e.g., Electric1).

We believe that each firm should pursue benefits that match their corporate objectives. Therefore, it is crucial to acknowledge the link between VES design and its resulting benefits, which are discussed below.

Another important consideration is that the benefits perceived depend upon the level of maturity. In our sample, we observed companies that recently implemented a structured VES and immediately achieved several benefits (e.g., White2), whereas others still need to develop their full potential (e.g., Fashion2, Energy1, and Energy2). For example, Energy1 owns a great deal of structured information that is not communicated to suppliers, thus losing possible opportunities for improvement. Finally, other, more mature companies (such as White1) may need to redesign their systems to match the evolution in the competitive environment.

With respect to system costs, a similar process has been followed (see Table 7). FTE refers to the manpower dedicated to system design, use, and maintenance. The tool refers to IT hardware and software used to support tasks; organizational inertia refers to internal clashes and conflicts with suppliers, and management and control costs refer to the time and effort devoted to handling conflicts, errors, and exceptions. In all, we observe that three types of costs arise out of a VES: capital expenses (primarily due to software licenses), operational expenses (due to FTEs and time employed), and organizational expenses (stemming from internal/external oppositions). Additionally, we do not have a quantitative measure of costs, only a qualitative report of cost types that the respondents considered relevant. Therefore, we do not aim to provide a quantitative cost/benefit analysis, only to present considerations about the relevant cost types.

6. Discussion

Considering the description of our results reported thus far, we take this opportunity to connect the characteristics of the VES (RQ1) to the level of satisfaction achieved by companies in the sample (RQ2).

First, we acknowledge the relevant benefits and costs of VES implementation according to the companies in our sample. In particular, following the results described in terms of declared benefits and costs, we can formulate the following propositions:

Proposition 1. *VES provides increased knowledge about suppliers to the buying firm, and the supplier can gain better knowledge about the relevant performance issues considered by the buying firm. Therefore, such knowledge can be exploited to enhance*:

- *Evaluation process efficiency*;
- *Evaluation process effectiveness*;
- *Supply chain relationships*; *and*
- *Supplier and customer performance*

Proposition 2. *VES implies costs to the user in terms of*:

- *Operational expenses* (*primarily related to the employees running the system*);
- *Capital expenses* (*primarily related to the infrastructure supporting the system*); *and*
- *Organizational inertia* (*both by the buying firm and the suppliers*)

Moving on to the connection between benefits/costs and VES design, we did not find a "one best way", i.e., a VES that should be adopted in every situation. On the contrary, we found convincing evidence that a good VES must be tailored to the specific characteristics of each company. For example, some companies need to emphasize prequalification, qualification and selection, whereas others should emphasize vendor ratings. Additionally, within a single company, different levels of complexity are appropriate for different purchasing categories. Therefore, we believe that some good design practices exist, which may ultimately result in a more efficient and

Table 8
Comparison of different VES designs.

Satisfaction / **Supporting cases**	***High*** *Electric1; Fashion1; White2; Auto1*	***Medium*** *Electric2; Energy1; Energy 2*	***Low*** *Fashion2; White1; Auto2*
VES strategic alignment	• Each company department relevant for the evaluation contributes to design and monitor the VES according to its own capabilities • The purchasing department integrate processes and measures into a comprehensive and consistent VES • Clear VES objectives (e.g. alignment to purchasing objectives, supply base reduction, transparency) • The VES requires a conscious definition of the purchasing and category strategies, which are aligned to the company strategy • Within the pool of KPIs, specific measures are chosen for different purchasing categories • Weights of KPIs are defined according to the category strategy and considering the inputs of peer departments	• One department (usually purchasing) defines the VES without integrating other departments' views • No clear VES objectives (the system is created as a consequence of generic process standardization objectives) • The VES is not explicitly linked to category, purchasing, and company strategies • The same set of KPIs is used for all categories • Weights corresponding to different peer departments are the same (arithmetic average) in order to ensure consensus	
Evaluation process	• Funnel evaluation process • Detailed and scalable process (many potential phases) • Process variants according to category characteristics • Standard initial phases, later customized • Pre-qualification is distinguished from qualification • All relevant departments are early involved • Common guidelines throughout the company but local delegation • Frequent update of vendor rating • Few easy-to-calculate indicators aligned to the category strategy	• Same simple process for all suppliers/categories • No clear distinction between phases • Not all relevant departments are involved • No common approach throughout the company • Low frequency of updates • Many indicators, not easily obtained from the data available	
VES execution	• One department (usually purchasing) manages the VES • The supporting tool enables automation, integrates all measures, integrates with the company ERP, and is shared among departments • Good formalization: clear processes and responsibilities • Communication to suppliers of both KPIs and targets • Follow-up actions starting from VES output (e.g. supplier development)	• The VES in not structured and responsibilities are unclear • The supporting tool is not automated, not integrated, and not shared • Either no formalization of processes and responsibilities or too rigid formalization (bureaucracy) • No communication to suppliers • No actions linked to the VES output	

effective VES, provided that they are selected and adopted consistently. Certainly, the proper design and execution of a VES also depends upon the company's history and characteristics. Therefore, we do not believe that all meritorious proposed practices must be adopted simultaneously by all companies. That said, managers may consider such practices as a useful checklist when they plan to design (or redesign) their own VESs, perhaps adopting an incremental approach.

Moreover, we do not find VESs that are either completely "good" or completely "bad". Instead, cross-case analysis allows us to note subsets of practices that ensure a system's positive effect in terms of benefits achieved. Such subsets are consistent with the previous description of VES characteristics and are shown in Table 8. In that table, some characteristics of VES design and execution are connected to the level of satisfaction with the system depending on the benefits achieved, as shown in Table 6. The two "high" and "low" columns are meant as extreme situations, not entirely corresponding to any of the cases analyzed. We simply show that some companies are, on average, more satisfied than others and that this is due to some of the critical characteristics of the VESs reported. In the middle, we can position companies (i.e., Electric2, Energy1, and Energy2) that reported intermediate levels of satisfaction, which were reflected in the adoption of some "good" and some "bad" practices.

In the end, it is important to note that different levels of satisfaction also depend on different levels of VES maturity. Relatively younger systems (e.g., Fashion2) are expected to require some time to reach their full potential. We have already seen that some companies said they used the VES to standardize the evaluation process, which does not reflect a clear perception of the potential benefits. Therefore, we assume that there may be a development cycle through which a firm might begin to design and implement a VES with simple objectives and later on, to exploit the VES to achieve greater benefits.

The first set of VES characteristics that can be connected to greater satisfaction relates to the VES's strategic alignment. Assuming that a commitment from top management and/or the CPO is necessary to develop a system, all of the relevant departments should be involved. Engaging all relevant stakeholders allows, on the one hand, for the exploitation of diversity and skills and on the other hand, for the creation of consensus within the firm about different aspects of the VES. This process often requires guidance, meaning that one department (usually purchasing) should be in charge of managing the design process and coordinating the efforts of its peers. As for specific system characteristics, we emphasize the importance of identifying clear objectives to maximize the effectiveness of tools and methods already in place rather than creating a VES simply for the sake of process control and standardization. In particular, to drive the VES in the right direction, a clear purchasing and category strategy is necessary. Adopting a portfolio management approach that distinguishes among specific category characteristics tailors the VES accordingly. For example, firms that are satisfied with their VES choose specific KPIs and relative weights according to the categories considered. Additionally, the choice of KPIs and weights should be the result of a collective effort and (if necessary) a negotiation among stakeholders. As a result, we can summarize the link between a VES's strategic alignment and the level of satisfaction achieved through the following proposition:

Proposition 3. *The level of satisfaction associated with a VES depends upon the following choices related to the VES's strategic alignment*:

- *Early involvement of relevant departments in the design process*;
- *Cross-functional coordination and mediation by the purchasing department*;
- *A clear and shared definition of system objectives*;
- *A clear and shared definition of the purchasing and category strategy*;
- *KPIs defined according to category characteristics*; *and*
- *A collaborative definition of KPI weights according to the category strategy*.

The second set of VES characteristics relates to the vendor evaluation process, which is an important part of the design process that deserves to be analyzed in depth. Case studies show that firms implementing a more sophisticated process are more satisfied. The level of sophistication depends on the number of possible process phases, the number of process variants, and the level of customization of each phase (usually according to different category characteristics, such as strategic importance). Overall, the best processes are those that start with standard and simple evaluation steps common to all suppliers and proceed – according to a funnel approach – with more detailed and customized steps performed only for a subset of more critical suppliers. For example, we observe that standard prequalification usually involves all potential suppliers, whereas specific company visits or product sampling are required only for some categories. The same logic applies to the frequency of iteration: although prequalification is usually valid for a longer period of time (1–3 years), vendor rating must be more frequent. Again, however, the frequency can be higher (e.g., monthly) for categories with a higher frequency of deliveries and standardized evaluation (such as repetitive direct materials), whereas it can be lower (e.g., 6–12 months) for less-regular deliveries and more complex evaluations (such as indirect materials or capital goods).

As anticipated, involving all relevant stakeholders from the beginning ensures the capability of assessing suppliers consistently and enhancing the likelihood of gain consensus. We observe that this requires not only good coordination skills but also the ability to delegate specific tasks. The importance of delegation emerges between the corporate and the business unit level, among different company departments, and among different roles within the purchasing department (such as the CPO and category managers).

At the end, in terms of vendor evaluation, we introduce the following proposition:

Proposition 4. *The level of satisfaction associated with a VES depends upon the following choices in terms of the vendor evaluation process*:

- *The use of a funnel structure in the process*;
- *A detailed definition of each stage of the evaluation*;
- *Process variants according to category characteristics*, *balancing completeness and required efforts*;
- *Early involvement of the relevant departments*;
- *Delegation of tasks to the appropriate players;*
- *The use of a focused and easy-to-use vendor-rating system.*

The last set of VES characteristics reflects how vendor evaluation is executed. We observe that clear process ownership (always entrusted to the purchasing department) is fundamental to mediating among different perspectives and integrating all processes and indicators into one comprehensive and consistent system. Moreover, such a system is more effective not only if it is correctly designed but also if it is properly supported by IT systems that allow for tracking all activities and converting data into meaningful information. Indeed, the firms declaring the greatest benefits are those using tools that automate low value-adding activities, integrate with other platforms (such as the company ERP), and facilitate information sharing.

Furthermore, the fewer the ambiguities are, the greater the benefits. Having a formal process in place that specifies activities, roles, and responsibilities ensures that every actor contributes to

the system objectives. This does not mean indulging bureaucracy but rather, offering clear guidance to all involved parties.

Finally, firms should not forget that the VES is not only an internal control system but also the primary interface with suppliers. Engaging many organizational units in such a large effort provides greater benefits than simple monitoring. Firms that do not communicate KPIs, targets and results to their suppliers and do not define improvement plans seem to miss important opportunities for supplier development and consequently for improving their own performances.

Therefore, we can state the following:

Proposition 5. *The level of satisfaction associated with a VES depends on the following choices in terms of VES execution*:

- *Process ownership by the purchasing department*;
- *The use of automated, integrated, and shared tools*;
- *Process formalization* (*avoiding bureaucracy*);
- *Internal and external communication*; *and*
- *Follow-up actions activated by the VES.*

7. Conclusions

The present study is a first attempt to reduce the gap between management requirements for VESs and the extant literature on this topic. In this paper, we investigate not only the VES design but also the benefits and costs arising out of implementation. Additionally, we highlight the combination of best practices that usually creates greater satisfaction.

In addition to the specific results presented above in the form of an answer to our research questions and our formulation of new propositions, we highlight some general principles that apply to any VES.

First, VES implementation and design is clearly related to purchasing maturity. The greater the relevance and status of purchasing within a firm, and the more advanced the purchasing organization and practice, the more VES is developed and consolidated.

Second, VES is intrinsically cross-functional because it requires coordination and alignment among different organizational units and different levels within each unit and between a company's headquarters and its subsidiaries. The purchasing unit, which is normally the process owner, plays a key role in mediating the various needs and positions of the parties, thus acting as an interface between suppliers and the company.

Third, an effective and efficient VES must be aligned with the company's overall strategy through the purchasing strategy – which is usually differentiated for different purchasing categorsies – adopting a portfolio approach (Kraljic, 1983; Luzzini et al., 2012). Therefore, VES must be differentiated according to different purchasing categories.

7.1. Theoretical contribution

Our results provide a new and significant contribution to the research because existing contributions primarily focus on indicators and methods while virtually neglecting VES design in terms of strategic alignment, process and execution, not to mention the impact of design choices on user satisfaction. Indeed, to the best of our knowledge, this is one of the first studies to provide a framework that includes the most important choices a firm must make when designing and implementing a VES. Therefore, we provide a different and complementary perspective, bridging a gap and integrating different approaches. In particular, we develop a comprehensive framework of the relevant constructs and variables included in the concept of VES design, and we identify best practices for design that appear to lead to higher user satisfaction in connection with a maturity model.

Consequently, this study also contributes to the strategic purchasing literature by adding an important element that ensures purchasing strategy and performance are aligned to corporate and manufacturing competitive priorities, according to the purchasing strategic planning process (Gonzalez-Benito, 2007, 2010). Given that company expenditures often account for a large share of company turnover, ensuring that a company's supply base is aligned to that company's competitive priorities is a crucial source of purchasing value creation potential.

7.2. Managerial implications

Our results are relevant to managers because VES receive a great deal of attention from CPOs and absorb the energies and efforts of several departments. Thus, our results can shed some light on the key variables to be considered when implementing or developing a VES, along with the best practices adopted by firms who have achieved a high level of satisfaction. As purchasing and supply chain scholars, every day we are involved in training and applied research projects with CPOs who are in need of implementation from scratch or of a redesign of their VESs. CPOs ask for guidance, consolidated procedures, benchmarking, and suggestions about required elements. They want a robust methodology that is not too complex to apply as a result of software-provider fees or most of all, due to natural organizational inertia in adopting new ways of work, both in terms of individuals and cross-functional relationships.

7.3. Future developments

This paper is at the theory-building stage of research. Therefore, according to Voss et al. (2002), its objective is to identify relevant variables and create new insights regarding the links among the identified constructs. Case study-based research has proved useful in this step, but obviously, because only a limited amount of data have been accounted for, there is a need to test, using a statistically sound sample, the validity of the propositions formulated. A theory-testing stage is the most immediate future development. In this way, a series of reliable guidelines for designing VES consistent with the competitive priorities for which a company endeavor would be available.

Furthermore, another possible future development is the creation of a systematic value assessment methodology to estimate the value of a VES in terms of quantitative benefits and costs, to overcome the limitations of this study.

Finally, this study investigates companies at a single moment in time and takes a retrospective approach. Therefore, it was not possible to observe the VES implementation process and evolution over time. A relevant future development would be a longitudinal study, perhaps taking an action research approach.

Appendix A. Interview protocol and researchers checklist

Interview questions

What are the motivations driving the design and adoption of the vendor evaluation system?

- Who are the people and what are the organizational functions involved in the system design?
- How long has the system been used?
- What are the main phases of the evaluation process?
- Who are the people and what are the organizational functions involved in the evaluation process?

- Do you adopt different processes/phases for different purchasing categories? Why?
- What are main supplier indicators? How are they selected?
- Do you assign different weights to indicators? How are they assigned?
- Do you monitor supplier performance after an order? How frequently? Do you always monitor similar indicators?
- Are suppliers informed about the evaluation process? Are suppliers informed about their own performances? Are suppliers involved in the indicators design?
- Did you observe any benefit as a consequence of VES implementation? What type?
- Did you observe any criticality as a consequence of VES implementation? What type?
- What are the costs associated with the system?
- Do costs and benefits vary according to type of purchasing category?
- Do you think the system can be modified and improved?

Researcher checklist

1. **General information about the company**
   a. Sales, EBIT, employees
   b. Purchasing department position in the organization chart, purchasing employees, overall company expenditure, share of purchasing over sales, coverage (share of expenditures controlled by the purchasing function)
   c. Purchasing department role
2. **Type of VES and related benefits**
   a. Adoption of VES: yes/no, reasons, start date, sponsor, update frequency, structure, level of formalization, types of indicators
   b. Importance of the system, benefits perceived
   c. Costs of the systems, criticalities
3. **Vendor evaluation phases**
   a. Number of phases
   b. Type of phases (qualification, selection, evaluation)
   c. Standard versus specific/customized for different categories
   d. Roles and responsibilities
4. **Drivers explaining the adoption of a VES**
5. **Drivers defining the evaluation process configuration**
   a. Always the same phases? If not, why? E.g., type of category/supplier.
6. **Drivers defining the evaluation frequency**
7. **Choice of indicators**
   a. Number, decision-making process, decision makers, strategic alignment.
   b. Which indicators are used for which phases?
   c. Which indicators are used for which categories/suppliers?

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