

# Empirical Investigation of Kraljic Portfolio Matrix

Yuan Ye\*

*California State University, Sacramento, Sacramento, California, USA*

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Expenditures on service purchasing have grown substantially for many organizations in recent years. However, many services are highly specialized or unique, creating significant challenges in managing service purchasing effectively. This paper applies the Kraljic Portfolio Matrix (KPM) to manage service purchasing strategically. The study first maps services into four quadrants based on the importance of purchasing and service type (i.e., professional services vs. mass services). It further develops specific strategic sourcing decisions based on the KPM for each quadrant. The discussed sourcing decisions include strategic risk assessment, the number of suppliers to use, the location of the supplier, supplier selection strategy, and the extent of information technology support for purchasing. The empirical findings shed light on identifying the most effective purchasing practices for services.

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\* Corresponding Author. Email address: [yuan.ye@csus.edu](mailto:yuan.ye@csus.edu)

## I. INTRODUCTION

In recent years, many organizations' expenditures on service procurement have grown substantially (Wynstra et al., 2018). With more services being purchased, the need to manage these services has also increased (Tate et al., 2009; Stouthuysen et al., 2012; Hofmann et al., 2020). Unlike tangible products, services tend to be intangible, perishable, heterogeneous, inseparable (Ellram et al., 2007), creating significant challenges for organizations to effectively control service purchasing processes (Ellram and Tate, 2015).

The Kraljic Portfolio Matrix (KPM), initially proposed by Kraljic (1983) in his seminal paper, provides a valuable lens to manage the purchased services strategically. KPM focuses on developing purchasing strategies for various commodities based on their potential value and supply risk. Organizations can then exploit purchasing power while ensuring continuity in supply.

Built on the KPM, there are two streams of literature emerging. One stream of literature attempts to extend KPM by considering the other factors (e.g., strategic importance, product complexity, management difficulty) to categorize commodities (Olsen and Ellram, 1997; Gelderman and Weele, 2003a; Bensaou, 1999; Knight et al., 2014). The other stream of literature investigates the feasibility or challenges of implementing the model practically (Wagner and Johnson, 2004; Caniels and Gelderman, 2005; Gelderman and Semeijn, 2006; Padhi et al., 2012; Montgomery et al., 2018).

The implementation of KPM involves two steps. The first step is to classify commodities into a two-by-two matrix based on their profit impact and supply risk. Accordingly, it is essential to determine how to measure these two dimensions. However, the qualitative nature of this model implies that it could be subjective to position items in the matrix. Therefore, sourcing decisions could be sensitive to the choice of

measurement variables and the threshold values that distinguish "high" and "low" values of these variables. In the second step, the KPM proposes to manage each category of items using different strategies. These strategies provide guidelines for organizations to minimize supply risk and exploit buying power (Kraljic, 1983). Yet, there are no clear discussions on linking the overarching strategy for each group of items to other strategic sourcing decisions. For example, while the KPM suggests that the primary strategy for purchasing commodities in the routine quadrant is to achieve functional efficiency, transforming functional efficiency to concrete practices that can be easily understood or implemented is not extensively illustrated in the model. Measurement vagueness is a primary drawback of the KPM (Olsen & Ellram, 1997; Gelderman & Weele, 2003b). From an empirical standpoint, developing concrete sourcing practices that can represent the core idea of KPM is critical to use this portfolio approach effectively.

Most empirical literature that applies or extends the KPM focuses on manufactured products rather than services. Scholars suggest that using theories and techniques developed in the manufacturing area directly to services procurement may not be adequate (Van der Valk and Axelsson, 2015). Thus, it is vital to consider the features of services when applying the KPM. Service operations literature discusses several factors to classify services, such as customer contact level, the expertise required for delivering the services, etc. (Chase, 1981; Schmenner, 1986). Among these factors, service type (i.e., mass vs. professional services) is regarded as a crucial factor since "*the buyer-supplier relationship differs essentially in mass service versus professional service exchanges*" (Stouthuysen et al., 2012, pp 426). Compared to mass services, professional services usually require the service provider to have

specific knowledge and closely interact with customers (Schmenner, 1986; Stouthuysen et al., 2012). As a limited number of suppliers can provide services that meet the buyer's unique requirements, the supply risk associated with purchasing professional services is typically higher than mass services.

This study aims to investigate the application of KPM in the context of service purchasing. The research question is: *What strategic sourcing decisions can drive service performance for each category of services based on the KPM?* The contributions are threefold. First, this work integrates the service classification scheme into the KPM. It suggests classifying services into the two-by-two matrix based on the value of purchased services and service type (i.e., mass vs. professional services). Second, it converts the primary strategy of managing each category of services illustrated in the KPM to measurable strategic sourcing decisions. These sourcing decisions include strategic risk assessment; the number of suppliers to use (i.e., single vs. multi-sourcing); the location of the supplier(s) (i.e., regional, national, or global); supplier selection strategy (competitive bidding vs. negotiation); and the extent of information technology (IT) support for purchasing. To my best knowledge, none of the existing studies have incorporated all these strategies into the KPM. Third, a rigorously designed survey collects data from service purchasing managers to test the proposed hypotheses. The respondent pool consists of randomly selected members of the Institute of Supply Management (ISM). The survey yielded 261 completed and usable responses. This study contributes to the KPM by empirically identifying the specific strategic sourcing decisions that positively affect service performance.

The remainder of this paper is organized as follows. In section 2, I review

the KPM and service classification literature. I further develop hypotheses based on the primary sourcing strategy of each category of services in section 3. In section 4, I describe the data collection process. Next, I use regression analysis to test the proposed hypotheses and summarize the results in section 5. Finally, I discuss the contributions and managerial implications in section 6.

## II. LITERATURE REVIEW

### 2.1. Kraljic Portfolio Matrix (KPM)

Kraljic (1983) proposes a portfolio matrix to categorize commodities based on two dimensions: profit impact and supply risk. Specifically, the dimension of profit impact is related to the purchase value, and the dimension of supply risk is driven by relationship uncertainty and supplier availability. According to the KPM, commodities are classified into four quadrants: non-critical, leverage, strategic, and bottleneck. The core tenet is to develop different types of purchases that align with commodities features to exploit buying power while ensuring supply continuity (Gelderman and Van Weele, 2003a; Pagell et al., 2010). The overarching sourcing strategy is summarized as "*form partnerships for strategic products; assure supply for bottleneck products; exploit power for leverage products and ensure efficient processing for non-critical products*" (Canelis and Gelderman, 2005, pp 141).

Several studies have contributed to the extension or application of the KPM. Some studies indicate that the KPM lacks consideration of the interdependencies between products (Olsen and Ellram, 1997) and potential changes of power dependence (Gelderman and Weele, 2003b). Accordingly, a stream of the literature suggests new dimensions to classify commodities or buyer-supplier relationships. Olsen and Ellram (1997) propose multiple internal and external

factors affecting the strategic importance and difficulty of managing purchases. Bensaou (1999) offers a contextual profile to categorize buyer-supplier relationships based on the buyer's specific investment and supplier's specific investment. He suggests a profile to manage relationships based on the mechanisms contributing to information sharing and knowledge exchange. Van and Weele (2000) present a portfolio model that uses profit impact and supply risk as two dimensions. Knight et al. (2014) propose an approach to profiling purchasing knowledge and skills. Using survey data, they identify three purchase situations and the corresponding required skills for effectively managing these situations.

Existing literature also raises concerns about the measurement issue when applying the KPM. These studies point out that the process of categorizing purchases based on many factors could be very subjective, and it is unclear what variables should be used to create the 2-by-2 matrix (Olsen and Ellram, 1997; Gelderman and Semeijn, 2006; Padhi et al., 2012; Montgomery et al., 2018). The relevant studies focus on discussing how to position commodities within the KPM. Padhi et al. (2012) use an objective multidimensional scaling approach to place commodities in the KPM based on supply risk and profit impact. Montgomery et al. (2018) adopt multi-objective decision analysis to position commodities to the four quadrants illustrated in KPM.

Despite its constraints, KPM is the foundation of developing appropriate sourcing strategies for various commodities (Gelderman & Van Weele, 2003; Knight et al., 2014). A few studies have empirically demonstrated the usefulness of the KPM. Gelderman and Semeijn (2006) explore the buying systems of managing global suppliers based on a case study. They find that KPM is a valuable tool for managing a global supply

base. Wagner and Johnson (2004) use data collected from multinational companies to verify the relationship between portfolio approach and competitive advantages. Caniels and Gelderman (2005) integrate two new factors into the KPM and use survey data collected from Dutch purchasing professionals to test the strategies proposed by the KPM.

## 2.2. Service classification

Although the KPM can be adopted to manage products and services, most empirical work is related to purchasing tangible products. Through the literature search, only limited studies have exclusively focused on services. From a practical perspective, it is desirable to identify a more appropriate dimension to discriminate services.

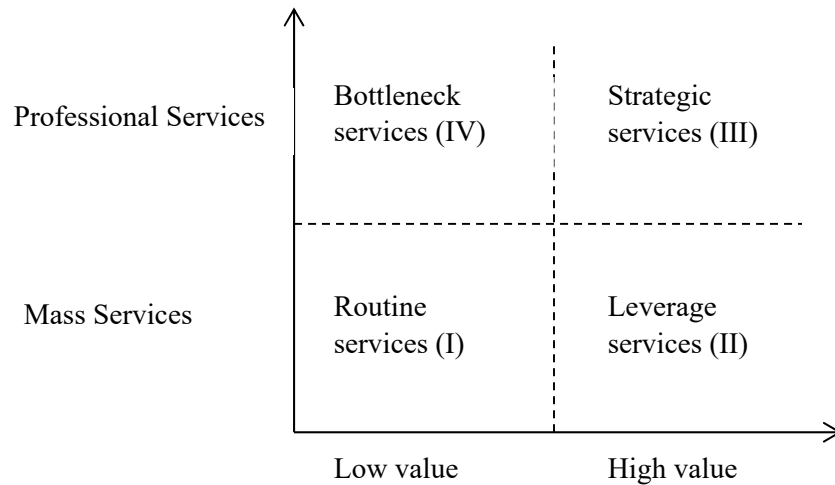
The research on service classification taxonomies has been developed since 1980<sup>th</sup>. Schmenner (1986) proposes the service process matrix (SPM) and classifies services into service factory, service shop, mass service, and professional services. The classification characteristics include the degree of labor intensity, customer interaction, and customization. Silvestro et al. (1992) develop a classification scheme based on people-focused and equipment-focused service characteristics. They propose six dimensions to categorize services: equipment/people focus, customer contact time per transaction, the degree of customization, the degree of discretion, value-added back-office or front-office, and product/process focus. Meyer et al. (1993) suggest a service process matrix based on customer influences and customization. Verma (2000) considers classification factors like labor intensity and customer contact. Voss et al. (2008) link the service operations strategy with customer experiences using customer experience and knowledge integration as two dimensions.

Most of these studies recommend distinguishing between professional services and mass services (Verma, 2000; Silvestro et al., 1992; Stouthuysen et al., 2012). Professional services refer to the services that demand significant expertise (Verma, 2000), and such services usually require high levels of customer contact and customization. Meanwhile, professional services are typically associated with higher supply risk since the service delivery process could be more complicated and uncertain. Examples of professional services include consulting, accounting, engineering, etc. For instance, business consultants usually need the service provider to have specific knowledge and customize the services based on customers' requirements. In contrast, mass services demand less expertise and customer interactions. Examples of mass services include janitorial, transportation, relocation, etc. These services are mainly used to facilitate management functions and general operations of the organizations. The supply of mass services is relatively stable, and there are typically multiple available service providers in the market. Categorizing services into professional services and mass services incorporates the supply risk dimension proposed in the KPM and considers the other characteristics of services such as buyer-supplier interaction and the level of expertise requirements.

## III. HYPOTHESES DEVELOPMENT

By integrating the literature on KPM and service classification, I propose a framework in Figure 1 to categorize services. The framework uses two dimensions for service classification: the purchase value and service type (i.e., professional services vs. mass services). Services are categorized into four quadrants: routine services (I), leverage services (II), strategic services (III), and bottleneck services (IV). I aim to analyze the

specific sourcing practices for services in each quadrant.



**FIGURE 1. CLASSIFICATION MATRIX**

*Quadrant I: Routine services.* Services in this quadrant have a low financial impact and are usually available from the market at a low cost. Examples include janitorial, landscaping, facility management services (Monczka et al., 2009). The principle of managing routine services is to simplify sourcing procedures through standardization and automation (Kraljic, 1983). For instance, information technology applications can be used to manage routine services efficiently.

*Quadrant II: Leverage services.* Services represent a significant portion of the expense and require a relatively lower level of expertise than strategic services. Leverage services are generally available from the market and have the potential for cost savings. Examples include uncomplicated services like transportation/logistics and MRO (maintenance, repair, and operations) associated with high expenses. The central tenet of managing this group of services is exploiting buying power and negotiating a low price with suppliers to achieve cost savings. For example, a company that has a limited number of suppliers can obtain cost savings through large purchasing volumes.

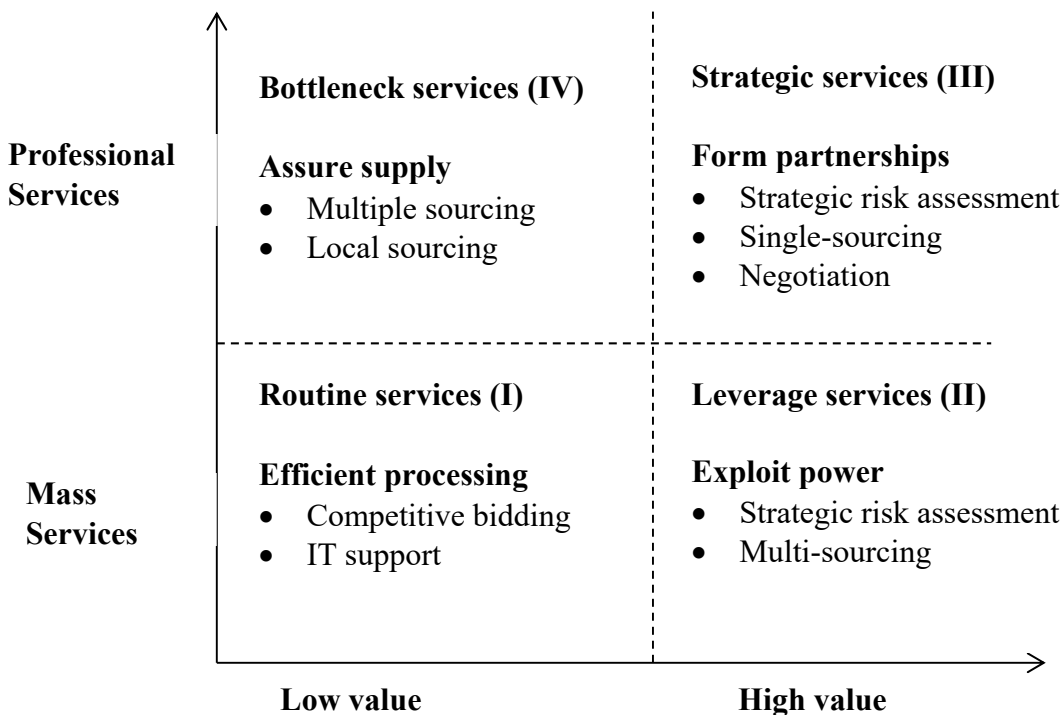
*Quadrant III: Strategic services.* Services account for a significant amount of expense and require a high level of expertise. Engineering or IT services that represent high purchase value can be considered strategic services. The sourcing decisions related to strategic services are critical since these services may have a high financial impact and are associated with significant sourcing risks (Gelderman & Van Weele, 2003a). The buyer is suggested to build a close relationship with the supplier to improve service performance and save costs beyond a simple purchasing contract (Monczka et al., 2009).

*Quadrant IV: Bottleneck services.* Services represent low value but require a high level of expertise. This category of services usually has a moderate financial impact. Nevertheless, they are vulnerable regarding service complexity and needs. The service provider has a dominant role in the relationship. Examples include a specialized lawsuit, consulting, or training services that demand unique knowledge and constitute a small purchasing expense. The main objective is to ensure the continuity of the supply and have backup plans (Kraljic,

1983; Caniels & Geldman, 2005; Monczka et al., 2009).

In sum, the overarching purchasing strategies for the four quadrants are summarized as follows: 1) standardize and automate the purchasing processes for routine services, 2) leverage purchasing power and demand lower price for leverage services, 3) form close partnerships with limited suppliers for strategic services, and 4) develop contingency plans and source from

multiple suppliers for bottleneck services. To convert the general strategies to detailed practices, I focus on five purchasing decisions broadly discussed in the purchasing literature, including strategic risk assessment, single vs. multiple sourcing, regional vs. non-regional sourcing, supplier selection mechanism, and information technology support. I map these practices into each quadrant and present the overarching framework in Figure 2.



**FIGURE 2. CONCEPTUAL MODEL**

### *Strategic risk assessment*

Strategic risk assessment refers to how the buyer comprehensively evaluates the strategic risks of purchasing a service (Handley & Benton, 2009). Anticipating the potential problems allows the buyer to develop a clear understanding of the costs and resources needed to manage the activities associated with purchasing (Handley & Benton, 2009). Strategic risk assessment also enables the buyer to evaluate the substantial impacts of purchasing service on the other relevant activities within an organization.

Being aware of these impacts will facilitate the buyer to arrange better for the internal stakeholders to exchange information, communicate, and achieve mutual agreements regarding the purchased service.

Although strategic risk assessment benefits the buyer, it requires the buyer to devote human resources to evaluations and coordinating with internal stakeholders. While different groups of services exhibit various impacts on financial performance or operational performance, organizations should allocate resources to services with a

higher economic impact. Accordingly, I propose two hypotheses as follows.

*H1a: Strategic risk assessment is positively related to the performance of leverage services.*

*H1b: Strategic risk assessment is positively related to the performance of strategic services.*

*Single sourcing vs. multiple sourcing*

Most operations management studies conceptualize single-sourcing as a cooperative strategy and multi-sourcing as a competitive strategy (Treleven, 1987). Yet, empirical studies on this practice cannot reach a consistent conclusion. On the one hand, some studies support the single-sourcing strategy (Feigenbaum et al., 1983) since it enables a close relationship between buyer and supplier. As such, the buyer can better understand the supplier through long-term cooperation. Meanwhile, single-sourcing allows the buyer to aggregate volume and reduce cost through economies of scale. Other benefits of single-sourcing include increased customer responsiveness and better financial performance (Chen et al., 2004). In sum, the advantages of single-sourcing are aligned with the primary goals of managing strategic services. Thus, I propose:

*H2a: Single-sourcing is positively related to the performance of strategic services.*

A multi-sourcing strategy empowers the buyer to select the supplier to offer the best price among competitors (Hahn et al., 1986). Moreover, the buyer can switch from one supplier to another if the latter offers a lower price or better quality. Thus, the benefits of multi-sourcing are aligned with the primary purpose of managing leverage services.

*H2b: Multiple-sourcing is positively related to the performance of leverage services.*

The primary goal for managing bottleneck services is to ensure availability. The buyer is typically suggested to source from multiple suppliers to hedge against the uncertainty of sourcing from a single supplier. The buyer can have a backup plan to respond to unforeseen issues. Accordingly, I propose a hypothesis as follows.

*H2c: Multiple-sourcing is positively related to the performance of bottleneck services.*

*Regional sourcing*

Domestic sourcing refers to sourcing goods or services that are delivered within the buyer's home country (Melanie, 2019). Likewise, I consider regional sourcing as contracting for services provided within the buyer's region. Sourcing from a regional supplier implies a close geographic distance between the buyer and supplier. From a relational standpoint, proximity improves the relationship between the buyer and supplier since they can coordinate quickly and respond to each needs more promptly (Takeno et al., 2015). It is also more convenient for the buyer and supplier to have more frequent interactions. Accordingly, the buyer can adapt to unpredictable changes and more effectively handle problems that arise during the processes of delivering complicated services.

Global sourcing can create economic value through low labor costs (Steven et al., 2014). It is more challenging to obtain cost savings if the purchase volume is low since the savings obtained from low labor costs might be offset by the increased cost caused by coordination and transportation needs. Hence, sourcing from a regional supplier brings more benefits to the buyer who purchases bottleneck services—the primary objective of managing this group of services is to ensure availability. Accordingly, I suggest a hypothesis below.

**H3:** *Regional sourcing is positively related to the performance of bottleneck services.*

#### *Supplier selection mechanism*

Competitive bidding and negotiation are the primary mechanisms a buyer can use to select its intended supplier. Competitive bidding requires the invited suppliers to provide the best price for a defined scope of work (Monczka et al., 2009). That is, several eligible suppliers submit their sealed bids to the buyer, and the buyer further awards the contract to the supplier who offers the lowest price or the best contract terms. Through competitive bidding, the buyer can compare prices across multiple suppliers and control the costs associated with purchasing (Monczka et al., 2009). However, this mechanism needs the buyer to define the scope of work clearly in the requirements. It constrains the buyer to leverage its power to demand price concession with the supplier. I propose competitive bidding as an appropriate choice for low-value mass services due to two reasons. First, it is usually easier to specify requirements for mass services than professional services. Second, the buyer may not want to spend extra time negotiating with the supplier for lower-value services.

**H4a:** *Competitive bidding is positively related to the performance of routine services.*

Negotiation means the buyer discusses with a single supplier to reach an agreement (Monczka et al., 2009). The buyer may demand a special price through negotiation or set up a well-defined performance metric for the purchased service. In return, the supplier can decide whether to accept the buyer's offer and make a particular commitment to deliver the service. Unlike competitive bidding, the buyer emphasizes several other aspects of service delivery in addition to the cost. This mechanism provides a good fit for strategic

services, for which forming a partnership is the primary goal. Accordingly, I propose:

**H4b:** *Negotiation is positively related to the performance of strategic services.*

#### *Information Technology Support*

Information Technology (IT) provides a valuable means to reveal the information regarding the transaction to the buyer (Eisenhardt, 1989). Following Bensaou and Venkastraman (1995), I define IT support as IT functionality facilitating inter-organizational coordination. Although the impact of IT has been empirically tested in the previous literature that examines manufacturing outsourcing (Bardhan et al., 2006), the literature on service outsourcing has rarely validated its role (Ellram et al., 2007). IT can automate some of the activities during service transactions and thus enables efficient coordination. Therefore, IT support is a necessary element of managing routine services.

**H5:** *IT support is positively related to the performance of routine services.*

## IV. RESEARCH METHOD

### 4.1. Data collection

I used a survey-based approach to test the proposed framework. I first developed most of the survey questions after reviewing the relevant literature. I next conducted a series of interviews with the industry practitioners to refine and extend the survey questions. Lastly, I invited academics to review and verify the content of the questions. Survey questions were anchored on a five-point Likert-type scale. The unit of analysis for this research is the contract used for purchasing a service. The professionals responsible for service purchasing were asked to respond to the survey. A pilot test was conducted to verify the instruments before sending out the survey. The survey



was further refined based on the results of the pilot test.

I approached the Institute for Supply Management (ISM) to administer the survey to its professional members. ISM is one of the most significant supply management associations in the world. It launched this survey in November 2016 and completed the survey in January 2017. Although the survey was randomly administered to 14,000 ISM members, only 728 members started to respond to it. Some respondents quit the survey when they saw the questions that solicited detailed information on contracts. The final sample contains 261 completed and useable survey responses, representing 35.6% of those who have opened the survey. I compared the variances between the early and late waves of the responses and found no obvious difference between the two waves, suggesting that non-response bias is not a problem in the sample (Krause, 1999; Armstrong & Overton, 1977).

## 4.2. Key informants and descriptive statistics

The detailed information of the survey sample (e.g., respondent profile, organization size, service type) are presented in Table A1 and Table A2 in the appendix.

### 4.2.1. Measurement instrument

**Professional/Mass service.** I invited 12 academic scholars to classify the sample into professional services and mass services. To assist them in categorizing services consistently, I define professional services and mass services based on previous literature. I integrated the opinions of these 12 scholars and finally distinguished between professional and mass services. Table 1 presents the detailed information of purchased services in the sample.

**Purchase value.** The total value of the purchase excludes subsequent fees incurred after signing a contract. Respondents were asked to choose between seven categories of value in US dollars: <\$200,000, \$200,000–\$500,000, \$500,000–\$1 million, \$1 million–\$2.5 million, 2.5 million–\$5 million, \$5 million–\$10 million, and >\$10 million. I use the median value of contract value in the sample as a threshold to distinguish between high and low-value purchases.

**Strategic risk assessment.** Strategic risk assessment reflects the degree to which the contracting team comprehensively evaluates the strategic risks of purchasing a service. Following Handley and Benton (2009), I measure this construct as the extent to which that a buyer considers 1) the impact that purchasing the service would have on its customers, 2) the impact that purchasing the service would have on its employees, 3) the potential negative consequence of losing the internal capability to perform this service, and 4) the risk of the external supplier(s) not fulfilling their responsibilities.

**Regional sourcing.** I ask the respondent to indicate if the purchase regional US, domestic US, or global. I consider a regional supplier that has a shorter physical distance from the buyer. I use a dummy variable to measure regional sourcing, where 1 implies that the supplier is the regional US, and 0 implies national or global supplier.

**Sourcing strategy.** I ask the respondent to indicate if it is a single-sourcing or multiple sourcing, where 1 denotes single-sourcing, and 0 denotes multi-sourcing.

**Competitive bidding.** I ask whether the buyer selects the supplier through competitive bidding or not. The alternative choices include negotiation, through a purchasing alliance, and others.

**TABLE 1. SERVICE DESCRIPTION**

	Frequency	Percent (%)	Service type
Transportation/logistics	37	14.23	Mass Service
Information technology	31	11.92	Professional Service
Construction	25	9.62	Mass Service
MRO	23	8.85	Mass Service
Engineering	18	6.92	Professional Service
Contract labor	11	4.23	Mass Service
Telecommunications	11	4.23	Mass Service
Consulting	10	3.85	Professional Service
Business consultants	9	3.46	Professional Service
Healthcare	7	2.69	Professional Service
Janitorial	7	2.69	Mass Service
Travel	7	2.69	Mass Service
Waste management	7	2.69	Mass Service
Landscaping	6	2.31	Mass Service
Business consultants	5	1.92	Professional Service
Human capital	4	1.54	Professional Service
Advertising	3	1.15	Professional Service
Delivery and Messenger services	3	1.15	Mass Service
Marketing	3	1.15	Professional Service
Temporary labor	3	1.15	Mass Service
Training	3	1.15	Professional Service
Relocation	2	0.77	Mass Service
Benefits administration	1	0.38	Mass Service
Insurance brokerage services	1	0.38	Professional Service
Utility services	1	0.38	Mass Service
Other	22	8.46	Professional/Mass Service

**Information technology support.** Information technology support is measured as the extent to which IT supports the following activities associated with purchasing (1) bidding 2) contract design,, 3) information integration, 4) coordination, 5) monitor and control, and (6) payment. I first obtained this instrument from Ellarm et al. (2007) and further included some additional items based on the suggestions from industrial practitioners.

**Service performance.** Service performance refers to the extent to which the supplier's performance has met the buyer's expectations, and this measure is mainly related to buyer satisfaction. I measure service performance from five aspects: 1) adhere to the contract requirements, including agreed budgets; 2) offer accurate and timely information; 3) respond to changes efficiently and effectively; 4) offer a

consistent level of service; and 5) offer customized service as allowed by the contract.

**Control variables.** I control a series of variables to account for the potential bias. I briefly describe these variables as follows.

**Contract type.** Contract type is measured by a dummy variable, such that 1 represents a fixed-price contract, while 0 implies a cost-based contract.

**Industry sector.** The industry is distinguished between the manufacturing industry and the service industry.

**Organization size.** Organization size refers to the total gross revenue in the most recent year for the organization.

**Prior interaction.** Prior interaction is measured by a dummy variable, where 1 represents means that the buyer has worked with the supplier before signing the current contract.

**Relationship length.** Relationship length is measured as the number of years that the buyer has been working with the major supplier who provides the purchased service: less than 1 year; -3 years; 3-5 years; 5-7 years; more than 7 years.

**Market competition.** Market competition represents the degree of which there are a sufficient number of qualified external suppliers for the current contract.

Table 2 presents the constructs used in this paper. The remaining survey questions are provided in Appendix B. Table 3 shows the correlation matrix for the key variables examined in this study.

#### 4.2.2. Reliability and validity

I conduct exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) to assess the quality of three constructs used in this essay, including strategic risk assessment, IT support and service performance. The results of EFA and CFA are presented in Table 4 and Table 5 respectively. EFA shows that the tested items loaded very strongly on their intended constructs. CFA verifies the reliability and validity of the constructs. Factor loadings for the checked items, Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE) for the latent construct are all within the accepted range. Specifically, factor loadings all exceed 0.4 (Hair et al., 1998), Cronbach's alpha and composite reliability are all greater than 0.7, and AVE is greater than 0.4 (Handley & Benton, 2015).

## V. ANALYSIS AND RESULTS

### 5.1. Service classification

Following the classification scheme proposed in Section 3, I classify the survey sample into four categories based on contract value and service type. The description of each category is given in Table 6. I find that about two-thirds of the services in the sample are mass services, and the rest of them are professional services. This finding is consistent with the fact that organizations typically tend to purchase services that are not regarded as their core competence. Since mass services are more general than professional services and are usually available from the market, organizations are likely inclined to purchase mass services more often than professional services.

### 5.2. Sourcing decisions by service category

As discussed in section 3, I focus on five factors related to service purchasing: strategic risk evaluation, single-sourcing vs. multi-sourcing, close vs. arm's length relationship, local sourcing vs. non-local sourcing, competitive bidding vs. negotiation, and information technology support. Table 7 represents the mean value and F-statistics regarding the key sourcing factors examined in this paper. Further, we rely on ordinary least squares (OLS) regression to analyze the effects of these factors on service performance within each service category. We also report variance inflation factor (VIF) and  $R^2$  for each regression model. VIF value for each regression model is below 3, indicating multicollinearity is not a problem for our model. Generally,  $R^2$  are all above 15%, suggesting the models can well explain our data. The detailed results are presented in Table 8.

**TABLE 2. CONSTRUCTS AND MEASURES**

Constructs	Items	Mean	Standard deviation
	<p><b>Referring to the <u>contracted service</u> you identified, please evaluate the extent to which you agree with the following statements.</b>  <i>(1—strongly disagree 2—disagree 3—neither agree nor disagree 4—agree 5—strongly agree)</i></p>		
Strategic risks assessment (SR)	SR1: The impact that contracting this service would have on our customers was evaluated.	3.97	0.96
	SR2: The impact that contracting this service would have on our employees was evaluated.	3.80	0.99
	SR3: The potential negative consequence of losing internal capability to perform this activity was considered.	3.77	0.99
	SR4: The risk of external supplier(s) not fulfilling their responsibilities was considered.	4.29	0.73
IT support (IT)	<p><b>To what extent does IT support the following activities associated with this contract?</b>  <i>(1-Very little 2-Little 3-Moderate 4-Great 5-Very great)</i></p>		
	IT1: Bidding	2.46	1.31
	IT2: Contract design	2.24	1.26
	IT3: Information exchange	3.00	1.32
	IT4: Coordination	2.66	1.36
	IT5: Monitor and control	2.62	1.38
	IT6: Payment	2.72	1.40
Performance	<p><b>Please indicate the primary supplier's performance as compared to your expectations.</b>  <i>(1-Far below expectations 2-Below expectations 3-Meet expectations 4-Exceed expectations 5-Greatly exceed expectations)</i></p>		
	PC1: Adhere to the contract requirements, including agreed budgets	3.28	0.60
	PC2: Offer accurate and timely information	3.24	0.64
	PC3: Respond to changes efficiently and effectively	3.28	0.64
	PC4: Offer consistent level of service	3.26	0.60
	PC5: Offer customized service as allowed by the contract	3.33	0.60

**TABLE 3. DESCRIPTIVE STATISTICS**

Variable	1	2	3	4	5	6	7	8	9
1.Fixed-price contract	1.00								
2.Purchase value	-0.12+	1.00							
3.Strategic risk assessment	-0.06	0.13*	1.00						
4.Prior interaction	-0.01	0.07	0.08	1.00					
5.Relationship length	0.05	0.16*	0.05	0.40**	1.00				
6.Single sourcing	0.14*	-0.14*	-0.03	-0.02	0.00	1.00			
7.Regional supplier	0.01	-0.10+	-0.02	-0.02	0.01	0.13*	1.00		
8.Competitive bidding	0.12*	0.09	-0.04	-0.04	-0.11+	-0.04	0.18**	1.00	
9.Service Performance	0.06	0.08	0.20**	-0.01	0.05	0.06	-0.03	-0.10	1.00

Notes: \*\*p<0.01; \*p<0.05; +p<0.1

**TABLE 4. EXPLORATORY FACTOR ANALYSIS**

Item	Factor1	Factor2	Factor3
SR1	0.21	0.03	<b>0.50</b>
SR2	-0.02	0.14	<b>0.55</b>
SR3	0.06	0.01	<b>0.61</b>
SR4	0.07	0.13	<b>0.68</b>
IT1	<b>0.81</b>	0.05	0.10
IT2	<b>0.83</b>	0.08	0.04
IT3	<b>0.81</b>	0.02	0.13
IT4	<b>0.90</b>	0.11	0.12
IT5	<b>0.90</b>	0.10	0.11
IT6	<b>0.73</b>	0.03	0.01
PC1	0.07	<b>0.73</b>	0.07
PC2	0.13	<b>0.74</b>	0.08
PC3	-0.04	<b>0.72</b>	0.07
PC4	0.06	<b>0.76</b>	0.01
PC5	0.11	<b>0.71</b>	0.21
<b>Eigenvalue</b>	<b>4.23</b>	<b>2.74</b>	<b>1.49</b>

**TABLE 5. CONFIRMATORY FACTOR ANALYSIS**

Constructs	Item	Factor loading
<b>Strategic risk assessment</b>		
Cronbach's $\alpha = 0.77$	SR1	0.51
Composite reliability = 0.77	SR2	0.53
AVE = 0.42	SR3	0.59
	SR4	0.68
<b>IT support</b>		
Cronbach's $\alpha = 0.93$	IT1	0.82
Composite reliability = 0.92	IT2	0.84
AVE = 0.64	IT3	0.82
	IT4	0.91
	IT5	0.90
	IT6	0.72
<b>Performance</b>		
Cronbach's $\alpha = 0.87$	PC1	0.76
Composite reliability = 0.87	PC2	0.76
AVE = 0.56	PC3	0.71
	PC4	0.78
	PC5	0.75

**TABLE 6. SERVICE CLASSIFICATION SUMMARY**

Service category	Contract value	Service feature	Observation number	Percent (%)
Strategic service	High	Professional	51	19.5
Bottleneck service	Low	Professional	48	18.5
Leverage service	High	Mass	81	31.0
Routine service	Low	Mass	81	31.0

**TABLE 7. SOURCING FACTORS BY SERVICE CATEGORY**

Sourcing factors	Service Category			
	Strategic	Bottleneck	Leverage	Routine
Strategic risk assessment	0.07 (0.74)	-0.23 (0.97)	0.04 (0.73)	-0.19 (0.78)
Single sourcing	0.35 (0.48)	0.46 (0.50)	0.25 (0.43)	0.38 (0.49)
Competitive bidding	0.63 (0.49)	0.52 (0.50)	0.65 (0.48)	0.64 (0.48)
Relationship length	3.08 (1.31)	2.52 (1.33)	3.23 (1.17)	2.83 (1.32)
Prior interaction	0.73 (0.45)	0.56 (0.50)	0.77 (0.43)	0.68 (0.47)
Local supplier	0.18 (0.39)	0.23 (0.42)	0.23 (0.43)	0.36 (0.48)
IT support	0.29 (1.07)	0.52 (0.96)	0.39 (0.93)	0.01 (0.89)
<b>Number of observations</b>	<b>51</b>	<b>48</b>	<b>81</b>	<b>81</b>

\* Mean value for each category shown as cell values, with standard deviation given in parentheses. Strategic risk assessment and IT support are given as factor scores

**TABLE 8. REGRESSION ANALYSIS BY SERVICE CATEGORY**

D.V. Service performance	Service category			
	Strategic	Bottleneck	Leverage	Routine
Company size	0.029 (0.060)	-0.054 (0.047)	-0.071 (0.048)	-0.007 (0.044)
Industry	-0.438 (0.312)	-0.558* (0.212)	-0.278 (0.225)	-0.339 (0.212)
Contract type (fixed price)	0.393 (0.301)	-0.401+ (0.216)	0.183 (0.211)	0.189 (0.200)
Market competition	-0.009 (0.139)	0.322* (0.139)	0.230+ (0.129)	0.308** (0.109)
Strategic risk assessment	-0.022 (0.192)	-0.024 (0.127)	<b>0.464**</b> <b>(0.146)</b>	0.068 (0.138)
Single sourcing	-0.191 (0.272)	<b>0.386+</b> <b>(0.222)</b>	0.185 (0.257)	-0.049 (0.217)
Local supplier	-0.122 (0.393)	<b>0.544*</b> <b>(0.255)</b>	-0.120 (0.242)	0.080 (0.232)
Prior interaction	<b>-0.861+</b> <b>(0.433)</b>	0.347 (0.261)	-0.046 (0.275)	0.023 (0.213)
Relationship length	0.044 (0.148)	0.089 (0.086)	0.145 (0.100)	-0.062 (0.079)
Bidding	<b>-0.933**</b> <b>(0.320)</b>	0.218 (0.227)	-0.250 (0.229)	-0.110 (0.226)
IT support	0.119 (0.134)	0.105 (0.120)	-0.149 (0.118)	<b>0.313*</b> <b>(0.119)</b>

+p-value<0.1; \*p-value<0.05; \*\*p-value<0.01

### 5.2.1. Sourcing decisions of strategic services

It was hypothesized that strategic risk assessment, single-sourcing, and negotiation would positively affect the performance of strategic services. Specifically, 1) the regression coefficient of strategic risk assessment on service performance is not significant ( $\alpha = -0.022, p > 0.1$ ), 2) the coefficient of single sourcing is insignificant ( $\alpha = -0.191, p > 0.1$ ), and 3) the coefficient of competitive bidding is negative and statistically significant, implying negotiation has a positive and significant impact on service performance. Thus, only negotiation is identified as a positive driver of service performance for strategic services. The results provide support for hypothesis 5b. I assume negotiation allows the buyer and supplier to understand each other's requirements and responsibilities better, thus improving the development of a close partnership. Therefore, this finding is almost consistent with the KPM that discusses strategic services

### 5.2.2. Sourcing decisions of bottleneck services

Multi-sourcing and local-sourcing were hypothesized as the primary drivers of the performance for bottleneck services. The coefficient of local-sourcing is positive and significant ( $\alpha = 0.544, p = 0.041$ ), which supports hypothesis 4. Surprisingly, the results show that the coefficient of single-sourcing is positive and marginally significant ( $\alpha=0.386, p=0.090$ ). These findings are partially consistent with the KPM, which recommends ensuring availability is critical for managing bottleneck services. Sourcing from a regional supplier enables the buyer to adjust faster to unpredictable changes than sourcing from a nearby supplier. In this way, the buyer can

interact more frequently with the supplier and have more opportunities to identify the availability of the bottleneck services. However, the empirical findings of this study suggest that multi-sourcing may not improve performance for bottleneck services. A possible explanation is that single sourcing allows buyer and supplier to build a close relationship, so the supplier may prioritize the buyer's needs when facing shortages.

### 5.2.3. Sourcing decisions of leverage services

It was hypothesized that strategic risk assessment and multi-sourcing would positively affect the performance of leverage services. The regression coefficient of strategic risk assessment on service performance is positive and significant ( $\alpha = 0.464, p = 0.002$ ), which suggests evaluating the potential risks of sourcing improves the performance of leverage services. The impact of multi-sourcing on service performance is positive but insignificant ( $\alpha = 0.184, p > 0.1$ ). The findings offer support for Hypothesis 1a. The results are partially aligned with the KPM, which suggests the primary goal of managing leverage services is to exploit power. It is anticipated that understanding the potential risk of supplier opportunism will help the buyer exploit its power and thus improve service performance.

### 5.2.4. Sourcing decisions of routine services

Competitive bidding and IT support were hypothesized as the main drivers of the performance of routine services. The regression coefficient of competitive bidding on service performance is negative and insignificant ( $\alpha = -0.110, p > 0.1$ ). The coefficient of IT support on service performance is positive and significant ( $\alpha =$



0.313,  $p = 0.011$ ). Our findings support Hypothesis 6 by identifying IT as an effective tool to manage routine services. The results are also almost aligned with the sourcing strategy for routine services that emphasize efficient processing. As I expected, IT can efficiently process information between the buyer and supplier, as well as expedite processes such as bidding and payment. Thus, IT can save the buyer more time to improve service performance. Besides the proposed hypotheses, market competition is positively related to the performance of routine items, implying a competitive market

may benefit the buyer to achieve desired outcomes.

Given the above discussions, I summarize the findings in Figure 3. I identify that 1) negotiation as a primary driver of the performance of strategic services, 2) sourcing from a regional supplier positively affects the performance of bottleneck services, 3) strategic risk assessment drives the performance of leverage services, and 4) IT facilitates efficient processing and positively influences the performance of routine services.

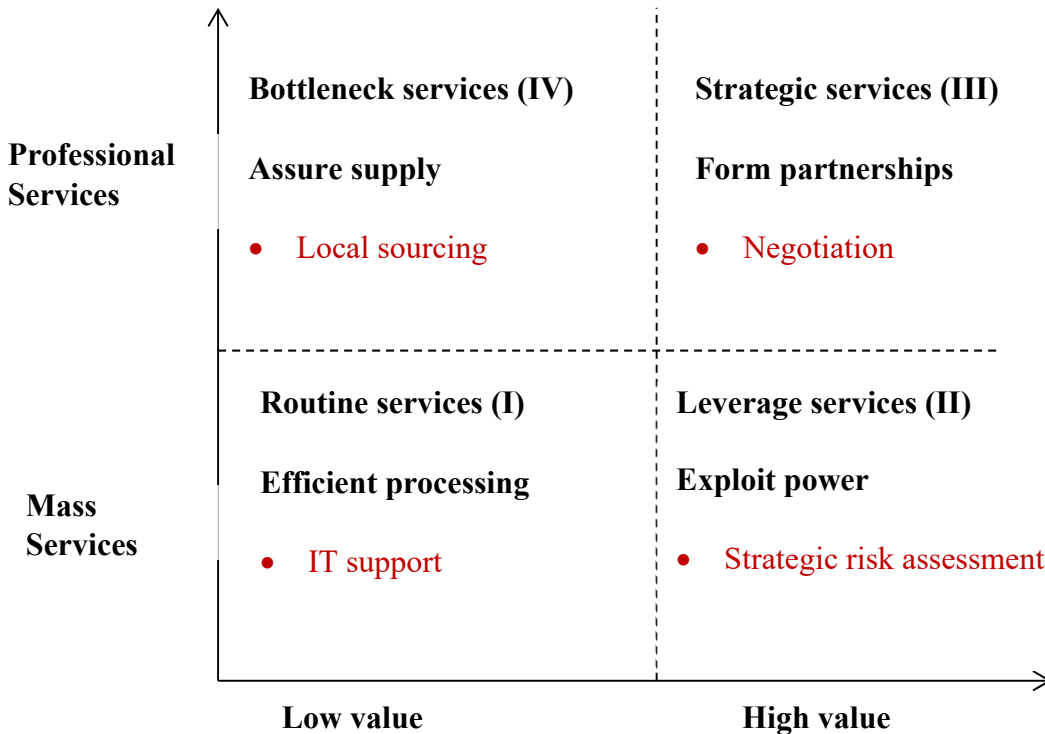


FIGURE 3. IDENTIFIED SOURCING PRACTICE

## VI. DISCUSSIONS AND FUTURE WORK

### 6.1. Contributions

The study develops a conceptual framework that integrates the KPM with

service taxonomies to examine the sourcing practices for services. I suggest categorizing services into four groups based on the purchase value and service type (i.e., professional service vs. mass service). I then discuss the most efficient sourcing decisions for each category of services and propose a series of hypotheses. I make theoretical and

empirical contributions to the existing literature on service purchasing.

From a theoretical point of view, the current study applies the KPM in service purchasing. To my best knowledge, most of the discussions on this model are given to the purchase of physical products rather than services. Services are more intangible and complex than products (Ellram et al., 2007). The literature on service taxonomies suggests differentiating between professional services and mass services based on the level of expertise required to deliver services (e.g., Schemenner, 1986; Silvestro et al., 1992). Likewise, I propose service type (i.e., professional vs. mass services) as a dimension to represent supply risk in the KPM.

The KPM only proposes key strategies to manage different groups of products but has not systematically discussed the specific sourcing decisions from a practical perspective. Accordingly, I consider five strategic sourcing decisions based on the sourcing literature, including strategic risk assessment, single-sourcing vs. multi-sourcing, regional supplier vs. non-regional supplier, competitive bidding vs. negotiation, and IT support. In this way, I convert the overarching strategies in the KPM to concrete sourcing practices. I propose a series of hypotheses to configure the effective sourcing decisions for each category of services.

Few studies have empirically tested the KPM, especially in service purchasing. Therefore, this work bridges the gap and obtains several significant findings based on the empirical analysis. Empirically, this study examines the proposed hypotheses based on survey data that collects service purchasing information from multiple industries. Specifically, negotiation is identified as a primary performance driver for strategic services since negotiation allows the buyer and supplier to know more about each other

and offers them opportunities to form a close relationship. The findings also indicate that sourcing from a regional supplier helps the buyer achieve better performance for bottleneck services. Shorter physical distance allows the buyer and supplier to interact more conveniently and adjust to unpredictable changes more quickly. For leverage services, the findings indicate a positive relationship between strategic risk assessment and service performance. Strategic risk assessment allows the buyer to understand the potential risks of purchasing a service, so the buyer can develop plans to hedge against these risks accordingly. Lastly, IT not only supports automatic processing but also enables the buyer to communicate more efficiently with the supplier. A positive relationship between IT support and service performance is identified for routine services.

## 6.2. Managerial implications

This study provides several managerial implications. The classification scheme proposed in this study informs organizations to categorize services based on service type and purchase value. As the KPM discusses the sourcing strategies for each quadrant focusing on tangible products, I attempt to fill this gap by extending this framework to service purchasing. I suggest organizations categorize services based on service type and purchase value.

Organizations can further convert the primary strategy into detailed and feasible sourcing decisions for each category of services. This study proposes incorporating five essential practices into the KPM, including supplier selection mechanism, supplier location, the number of suppliers to use, conducting a risk assessment before purchasing, and the usage of IT to support purchasing. The findings from this study provide organizations guidelines to choose the most appropriate sourcing practices that

align with service features to achieve the desired performance.

### 6.3 Future work

Several research directions follow. First, this study examines the impacts of five sourcing decisions that are relevant to the KPM, which are mainly carried out in the stage of supplier selection. Future research may explore the decisions that are developed in the other stages of purchasing. For instance, some portfolio model indicates that it is important to include contingencies plans to manage bottleneck services. Future work can study if contingency plans improve the performance of bottleneck services. Additionally, the study only tests the individual effect of each sourcing decision on performance but has not examined the interaction effects of these sourcing decisions. A future extension can investigate the combined effects of two or more sourcing decisions. Moreover, the dependent variable in this study is primarily related to buyer satisfaction. Future research can also study some other performance metrics such as costs. For example, although I identify a positive link between negotiation and buyer satisfaction for strategic services, there is a possibility that negotiation can increase costs. Hence, future work can explore the effects of sourcing decisions on various performance metrics. As indicated by some literature, the commodities placed in the KPM can shift due to market change. Future studies may employ panel data to investigate how the shift of commodities may affect the sourcing strategies that contribute to service performance.

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APPENDIX A

**Table A1: Respondent Profile**

	<b>Percent</b>
<b>Sector</b>	
Manufacturing	44%
Service	56%
<b>Respondent Title</b>	
Senior VP, Executive VP, CEO	3%
Vice President	3%
Director, Senior Director	17%
Manager	45%
Practitioner	18%
Consultant	7%
Other	8%
<b>Purchased services</b>	
Transportation/Logistics	14%
Information technology	12%
Construction	10%
MRO	9%
Engineering	9%
Telecommunications	7%
Consulting	4%
Contract labor	4%
Other	32%
<b>Company Size (gross revenue)</b>	
Under \$50 million	20%
\$50 million - \$99 million	5%
\$100 million - \$499 million	16%
\$500 million - \$0.99 billion	10%
\$1 billion - \$4.99 billion	20%
\$5 billion - \$9.99 billion	6%
Over 10 billion	22%

**Table A2: Sample Description**

	Frequency	Percent
<b>Contract type</b>		
Fixed price	144	55%
Cost-based	114	44%
Not Applicable	3	1%
<b>Contract value</b>		
Less than \$200,000	55	21%
\$200,000-\$499,999	37	14%
\$500,000-\$999,999	29	11%
\$1,000,000-\$2,499,999	46	18%
\$2,500,000-\$5,000,000	22	8%
\$5,000,000-\$10,000,000	22	8%
Great than \$10,000,000	42	16%
Not Applicable	8	3%
<b>Regional/National supplier</b>		
Regional	68	26%
National	75	29%
Global	113	43%
Not Applicable	5	2%
<b>Supplier selection mechanism</b>		
Competitive bidding	162	62%
Negotiation	71	27%
Through a purchasing alliance	12	5%
Other	16	6%
<b>Relationship length</b>		
Less than 1 year	32	12%
1-3 years	77	30%
3-5 years	64	25%
5-7 years	36	14%
More than 7 years	46	18%
Not Applicable	6	2%
<b>Prior interaction</b>		
No	181	69%
Yes	78	30%
Not Applicable	2	1%

## Appendix B: Survey Questions

**Purchase value.** The total value of the contract in US dollars (your best estimate):

- Under \$200 thousand (1)
- \$200 thousand-\$499 thousand (2)
- \$500 thousand-\$999 thousand (3)
- \$1 million-\$2.49 million (4)
- \$2.5 million-\$4.99 million (5)
- \$5 million - \$10 million (6)
- Over \$10 million (7)
- Not applicable (8)

**Sourcing location.** Is this contract regional US, domestic US or global?

- Regional US (1)
- Domestic US (2)
- Global (3)

**Supplier selection.** Please indicate how the supplier for this contract was selected.

- Competitive bidding (1)
- Negotiation (2)
- Through a purchasing alliance that our company belongs to (3)
- Other (please specify) (4)

**Sourcing strategy.** Please indicate the sourcing strategy of this service:

- Single-sourcing (1)
- Multi-sourcing (2)

**Contract type.** Please indicate the compensation clause of this contract.

- Fixed price contract (1)
- Time and material (T&M) contract (2)
- Cost plus fixed-fee contract (3)
- Cost plus incentive-fee contract (4)
- Other (please specify) (5)

**Industry sector.** Which of the following classifications best describes your organization's industry sector and/or sub-sector.

- manufacturing industry
- service industry.

**Organization size.** What is the total annual gross revenue in FY 2015 for your company or organization?

- Under \$50 million (1)
- \$50 million - \$99 million (3)
- \$100 million - \$499 million (4)
- \$500 million - \$0.99 billion (5)
- \$1 billion - \$4.99 billion (6)
- \$5 billion - \$9.99 billion (7)
- Over 10 billion (8)

**Prior interaction.** Q32 Did you work with this supplier before signing the current contract?

- Yes (1)
- No (2)



**Relationship length.** Q33 How long have you been working with this supplier?

- Less than 1 year (1)
- 1-3 years (2)
- 3-5 years (3)
- 5-7 years (4)
- More than 7 years (5)

**Market competition.** Referring to the contracted service you identified, please evaluate the extent to which you agree with the following statements.

(1—strongly disagree 2—disagree 3—neither agree nor disagree 4—agree 5—strongly agree)

There are a sufficient number of qualified external suppliers for this contract.