On-line Supplement: Contracting Efficiency and New Firm Survival in Markets Enabled by Information Technology

1. Survey Data Collection Methodology

Recent empirical research in contracting has relied upon the technique of collecting data on recently completed client engagements (e.g., Banerjee and Duflo 2000). In our case, since the ASP relationship is an ongoing process, there should be no problems associated with retrospective recall in looking at current client relationships supported by the ASP. As a part of a pilot, initial contacts with ASPs were made over the phone by the data collection agency. During the pilot phase, it became evident that ASPs were unwilling to identify individual projects, such as providing us archived records of past or ongoing engagements. This reticence to provide details about clients could possibly be due to client privacy concerns and also perhaps because the ASP model was still in its nascent phase at the time of data collection. Many of the ASPs contacted by us were also unwilling to identify specific financial details such as revenue from a client engagement, the estimated costs and actual costs incurred such as the price charged per man-month.

Instead, we found that ASP personnel were willing to talk about a representative or typical client engagement they were currently involved in, without identifying the client or financial details. Given these realities, we designed the survey instrument to focus on characteristics of contract choices for a typical client engagement. Since we used a professional data collection firm that contacted companies via telephone, we could get responses from multiple informants including the personnel involved in client liaison or client engagement rollout to answer the questions. This improves the chances of obtaining responses that pertain to a truly *representative* client engagement for an ASP.

We anchored the respondents into providing details about representative client engagements by asking them what applications they ***currently*** offer to clients. The words “typical” and “representative” were used throughout the conversation. Instead of asking respondents to identify a client engagement, we asked: ‘can you answer these questions about a typical client engagement that you are currently engaged in?’ Questions were designed to emphasize ongoing client interaction and client engagements that an ASP is currently engaged in. For example, questions included:

- For a typical current engagement, which of the following describes the final status?
- What is the term of a typical current contract between your company and a client?

We included checks to examine differences within a customer base and client engagements supported by a single ASP. Client engagement level characteristics can be inferred by asking questions such as:

- For the clients that you currently serve, to what extent do you agree that your service provides the following?
- What are you doing to meet client expectations in your current engagement?
- What are the top three things that you need to communicate with clients?
- How do you differentiate your service across your users? How do you differentiate your service depending on client size?

Our empirical approach is anchored upon a well-established precedent of prior research on agency costs and misalignment that has similarly focused on scenarios where there is heterogeneity across the organizational level (e.g., Azoulay and Shane 2001, Shane 2001 etc). Each survey response was exhaustively validated against publicly available data about the vendor. When matching survey data with publicly available data sources, out of the 153 responses, we were unable to match details about the details of the service engagement with the survey data for two observations, which were dropped from the analysis.

2. Questionnaire Design and Survey Administration

Data was collected through a telephone and mail survey by a professional organization with the expertise and contacts required for a large-scale data gathering effort. The questionnaire was designed following the concepts of survey design (e.g., Dillman 1978). Respondents were extensively pre-screened through telephone interviews in order that we could define the terms in the survey and ensure that the respondents understand the survey questions. As part of the screening process each ASP was asked to provide details about a current service agreement undertaken for a client. To minimize potential biases, the respondents were assured that their responses and identity would remain confidential. All respondents had to qualify for our definition of ASP: "*a company that provides access to remotely hosted IT applications over a Wide Area Network (WAN), a Virtual Private Network (VPN) or the Internet. These*

services may include Financial and Accounting applications, IT Networking applications, and Customer Relationship Management."

Prior studies recommend using key informants in evaluating exchange performance (Poppo and Zenger 1998, Phillips 1981). We specified that informants should be individuals in executive (CEO, VP, CIO etc) or managerial positions in ASP firms who are likely to be well informed. We also used a multiple informant technique to elicit responses. When the interviewer determined that the respondent would not be able to answer some of the questions, a referral was sought to someone knowledgeable about the question(s). Given that some of our measures are self-reported by the respondents, we included a "don't know" response category to minimize the risk of obtaining inaccurate responses. The questionnaire is provided below.

Table 1: Summary of ASP Questionnaire
(*Items measured on 7 point Likert scale, except contract length)*

Construct	***Items for Subjective Measures (Measured on 7 point Likert scale)***
Length of contract Term of contract between you and your client	• Less than one year • One year to two years • Two years to three years • Three years to five years • Longer than five years
Service Uncertainty	For a current client engagement, how difficult is it to estimate each of the following? Integration with existing client capabilities Compatibility with future standards in client organization Implementation period Unforeseen technical problems Service costs
Service Level Agreements	How strongly do you agree or disagree that these are important based on the above engagement? SLAs (Service Level Agreements) on network reliability and security SLAs (Service Level Agreements) on customer response time Tools and tracking systems to prove SLA (Service Level Agreement) achievement
Relational norms	How strongly do you agree or disagree with the following statements about working with your client? Client company's senior management is willing to share workload and information with my company Client company's senior management thinks the use of my company's services is a good way to obtain IT functionality Client company's IT department is willing to share workload and information with my company We have strong partnerships with our clients
Client specific investments	How strongly do you agree or disagree with the following statements about the current engagement? We acquire knowledge specific to the client's business domain We have experience in the client's industry or vertical market. We invest in application specific knowledge in functional areas

	We acquire knowledge specific to client's company
Expectations of cont. interaction	How strongly do you agree or disagree with the following statements about working with your client? Our client is willing to partner with us to meet their future application outsourcing needs We invest in future business application outsourcing needs of the client
Technical Capabilities	For a current client engagement, how strongly do you agree or disagree with the following statements? We invest in network infrastructure We invest in network management tools We offer the ability to achieve 'best business practices' We offer our clients access to best technology
Application type Based on the above client engagement, what is the application supported by the ASP? (A dummy variable was coded based on responses =1 if there is greater interaction with applications in the clients' organization)	• Web Hosting • IT Support, Web, or E-mail applications • Productivity applications, such as word processing, spreadsheets, and database management • Financial, accounting or human resource • Enterprise Applications such as Enterprise Resource Planning (ERP) • E-Commerce applications or functions, such as fulfillment, credit card processing, and inventory control • Customer Relationship Management including Sales Force Automation • Supply Chain Management

An exploratory factor analysis revealed that the variance explained by the first factor was less than 25% of the total variance. A confirmatory factor analysis was carried out and the principal components extracted were used in subsequent analyses. The factor loadings and scale development are presented below in Table 2. The composite reliability, which reflects the internal consistency of the indicators (Nunally 1978), for multi-item indicators was above the recommended value of 0.7 for all the constructs. The *t* values for all the indicators exceeded the critical value of 3.29 at a *p* level of 0.01, supporting convergent validity. A Chi-Square test conducted to assess whether there was covariance across the indicators provided support for discriminant validity.

TABLE 2: Scale development and refinement

Constructs	Indicators	Std. loading	Std. Error	T value	P value	Composite reliability
Service uncertainty	UNC1	0.90	0.13	14.22	<0.01	0.96
	UNC2	0.92	0.14	13.33	<0.01	
	UNC3	0.91	0.14	13.02	<0.01	
	UNC4	0.95	0.14	12.82	<0.01	
	UNC5	0.90	0.14	12.80	<0.01	
Performance guarantees	SLA1	0.88	0.10	7.88	<0.01	0.96
	SLA2	0.96	0.09	10.89	<0.01	
	SLA3	0.92	0.10	11.36	<0.01	
Client Specific investments	SPECINV1	0.97	0.09	9.17	<0.01	0.97
	SPECINV2	0.93	0.08	8.38	<0.01	
	SPECINV3	0.86	0.09	7.57	<0.01	

	SPECINV4	0.75	0.07	8.17	<0.01	
Relational norms	REL1	0.95	0.11	9.01	<0.01	0.96
	REL2	0.90	0.08	9.89	<0.01	
	REL3	0.85	0.10	12.12	<0.01	
	REL4	0.79	0.11	6.08	<0.01	
Expectations of Cont. Int.	CONT1	0.73	0.12	6.13	<0.01	0.97
	CONT2	0.89	0.13	7.88	<0.01	
Technical capabilities	CAP1	0.83	0.24	7.07	<0.01	0.98
	CAP2	0.84	0.15	7.36	<0.01	
	CAP3	0.89	0.19	8.21	<0.01	
	CAP4	0.80	0.11	7.60	<0.01	

3. Qualitative Evidence on Contracting and Service Strategies of ASPs

In the main manuscript we provide a set of representative quotes from ASPs highlighting the distinctions between different service strategies of ASPs and sources of contractual misalignment. In Table 3 below we elaborate more on this aspect by providing a sample of self-reported service strategies of ASPs. Quadrant 1 and quadrant 3 are quotes from ASPs with aligned contracts while the quadrants 2 and 4 present quotes from ASPs that have misaligned contracts. When examining quadrants 1 and 3, we notice that ASPs with fixed price contracts should ideally focus on lowering costs to customers by providing a standardized and reliable service whereby the ASP and the client can reap the benefits of shared infrastructure and hosted applications while ASPs with time and materials contracts should provide services that deliver greater value to the client and tailored to each client's needs. However, when ASPs try to provide a unique service to each client, but the contract does not take into account the potential for risk sharing or measurement problems associated with that type of service, the resultant contract is misaligned as in quadrant 4. As a result an ASP may be expending effort on dimensions of service that are not considered valuable by the client, which could lead to customer dissatisfaction and contract cancellation.

Table 3: Service Strategies of ASPs and Contract Types

Contract Type	Responses from horizontal service providers	Sample of responses from vertical service providers
Fixed Price Contract	Quadrant 1: Aligned contracts • "We don't differentiate between different types of customer." • "We sell a specific solution, so it is not any different." • "We offer a stable platform and good connectivity."	Quadrant 2: Misaligned contracts • "We provide solutions tailored to client needs." • "We try to meet all client needs." • "We provide integration with back end systems in the client organization." • "We offer a wide variety of skills and

	• "We don't differentiate our service across customers, we try to offer better service levels than our competitors." • "Our customers are similar; our solution does not differ." • "Our strength is the automated web-based solution. Our solution is geared towards small and medium businesses." • "We communicate the reduced labor cost and down time offered by our service. It is pretty much the same for all customers."	technical expertise customized to each client." • " We do custom applications." • "The strength of our service is frequent updating and customizing our solution."
Time and Materials Contracts	Quadrant 4: Misaligned contracts • "We sell a standard service to clients." • "The cost and the technology do not differ; it does not matter who the end user is." • "We market differently to large and small clients; the service itself is not different." • "Our strength is the reliability and quality of service. We do not customize." • "Our clients have similar business and hosting needs." • "Our software is scalable and offers the advantage of speed and accuracy. Our services do not differ (across customers)."	Quadrant 3: Aligned contracts • "Our clients are small and mid-market and they have specific needs. Everything we do is custom." • "We sell a service package instead of a component, so it is custom." • "Our solution is on a case-by-case basis. We understand the client and customize the solution." • "We do specific development for clients and spend effort in understanding the client's business model." • "We offer consulting capabilities and product knowledge in addition to a solution." • "We view the ASP as a partnership. Our requirement gathering process allows clients to actively participate."

A similar picture emerges when we query ASPs on the value that they deliver to clients and their investment in processes that may lead to competitive advantage. To illustrate the tradeoffs faced by early ASPs, consider the following hypothetical scenario: An ASP that provides web-based analytics for mortgage lenders can undertake expensive investments in capacity such as investing in server farms. However, another option is to provide focused service to clients by providing information on customer profiles and regional distribution of loans. By developing a solution guided by business needs rather than by leading-edge technologies, ASPs will be able to confer business value to the clients that they are targeting.

Our interviews reveal that ASPs with misaligned contracts invest in building capabilities that are not matched with their contract structures. For resource-starved firms operating in a new market, the consequences of choosing to undertake such investments could be highly detrimental to customer acquisition and revenue growth. Table 4 presents ASPs' assessment of value offered to clients through

their service. Once again, the value proposition offered by ASPs needs to be aligned with the incentives offered by the contracts.

Table 4: Factors Highlighted by ASPs as their Unique Value Proposition

	Horizontal ASPs	Vertical ASPs
Fixed Price Contracts	Quadrant 1: Aligned governance • "We offer reliable service." • "We offer better infrastructure and connectivity." • "Our customer service and response times are better." • "We offer better customer service." • "We offer faster deployment." • "We offer shrink wrap commercial software."	Quadrant 2: Misaligned governance • "We conduct thorough research of our client needs and develop services accordingly." • "We want to offer a single point contact to our clients. We want to meet all their business application-outsourcing needs." • "We invest in client contact personnel and processes to keep in touch with customers and provide the service they want."
Time and Materials Contracts	Quadrant 3: Misaligned governance • "We offer reliability and low cost of service." • "We offer reliable service and customer support." • "We provide onsite support." • "Our service offers the ability to respond in real-time." • "Our expertise is purely technological."	Quadrant 4: Aligned governance • "We offer end-to-end supply chain management service." • "We have experience specific to the client's industry." • "We integrate order management into business processes." • "We offer the ability to link legacy systems with web-based interface." • "We develop solutions specific to clients. We have CMM Level Two standards."

4. Assessing Heterogeneity in Service Offerings of ASPs

One potential issue with our data collection approach is that if an ASP undertakes many different types of client engagement, responses regarding a typical or representative client engagement may not capture the diversity of services (and associated contract regimes) that the ASP may offer. However, as explained in the main manuscript, we have qualitative support from our survey that the ASPs in our sample typically targeted one type of customer.

We also checked if ASPs differentiated their offerings across their customer base, by asking them qualitative questions about (i) how they differentiate their offerings from competitors and (ii) how they differentiate offerings across different customers. The former contributes to heterogeneity across ASPs, while the latter contributes to heterogeneity of client engagements done by an ASP. Examining service heterogeneity allows us to assess whether client engagements are similar within an ASP.

To account for heterogeneity in service strategies of ASPs, a weighted measure of misalignment was calculated by dividing the misalignment score with the number of service offerings of each ASP. The results found that heterogeneity in service offerings does not significantly bias the results in this paper.

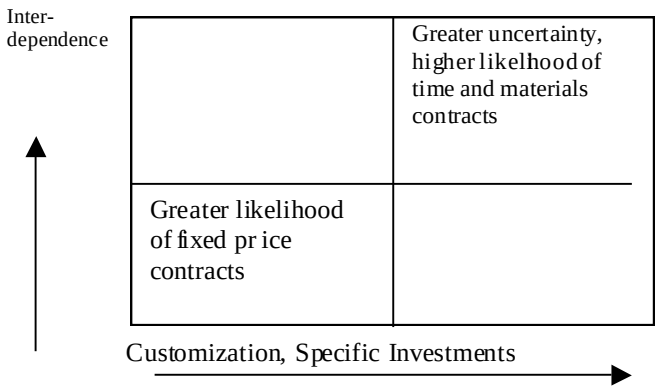
Further, we also examined that possibility that a client with a high degree of external visibility could impact survivability depending on service heterogeneity.

In addition to the tests described in the paper, we conducted additional checks for robustness. Below, we outline the checks conducted, in addition to the ones described in the paper, to rule out that the results are not subject to biases due to heterogeneity in service offerings.

(i) Tests to Assess Heterogeneity across ASPs

The variation across the sample of ASPs results from the different applications that are offered by different ASPs. In the figure 1, we coded the application type according to the extent to which an ASP's service needs to be tailored to its clients and customization.

Figure 1: Service Offerings, Interdependence and Customization



When we divide the sample according to the interdependence in the applications supported by the ASP and the extent of customization, as indicated in the figure 1 above, there is likely to be substantial variation between the 1st and 3rd quadrants in terms of client engagement characteristics. An analysis of deviance using Chi-Square tests (similar to ANOVA) comparing across applications reveals that applications with greater interdependence and greater customization have higher likelihood of time and material contracts. Pair-wise t-tests also reject the equality of means of contract, contract length and uncertainty across different applications, demonstrating substantial heterogeneity across ASPs.

When an ASP offers a single service, however, it does not necessarily imply that the ASP provides a fairly standard and homogeneous service to all its clients. Consider an ASP that provides hosting of enterprise solutions such as inventory management. The ASP-hosted service needs to access

data from internal databases of the client organization. Similarly, some ASPs that host billing services provide integration to customer care and call centers, so that conversations with customers are also opportunities for discounted offers and promotions. The ASP needs to provide interoperable service, necessitating an understanding of business processes and system requirements of the client. While the ASP may provide similar services to other clients, the service itself is far from uniform in that it needs to be tailored to individual client needs.

(ii) Tests to Assess Heterogeneity within ASPs

We then focus on whether there is substantial difference in the client engagements within each ASP, which depends on the service strategy adopted by individual ASPs. The two basic service strategies adopted by ASPs involve (a) a horizontal approach, where the ASP provides a functional solution that does not differ across different clients and (b) a vertical solution provider approach where the ASP provides a custom application that takes into account business requirements of clients. Our sample indicates that ASPs *either* provide a functional solution that does not differ across clients, *or* provide a more custom application that needs specific investments and customization. This approach reflects itself in the self-reported assessment of ASP's expertise in providing services to clients.

In our qualitative data gathering we find that horizontal ASPs tend to highlight the cost savings and reliability of their service while vertical solution-provider ASPs tend to highlight their domain expertise. Horizontal service providers are more likely to focus on building competencies on technical dimensions, such as investing in technical standards, while vertical service providers are more likely to focus on building capabilities for client interaction through strategic alliances and partnerships with clients and feedback from customers as the most important. Ideally, this distinction should reflect itself in the contract design.

From a list of qualitative responses from the ASPs, we feel justified in our assumption that the typical engagement (that we have collected data about) is indicative of all client engagements for an ASP. After a thorough analysis of the qualitative responses, we concluded that the heterogeneity in the sample is a result of the across-ASP heterogeneity, which provides evidence of our hypotheses about the degree of divergence from efficient contracting, rather than heterogeneity across client engagements done by a

single ASP. For robustness we also compared the estimates with a weighted score of misalignment as described in the paper, and found no evidence of bias due to heterogeneity in service strategies.

5. Distinguishing between Exit and Acquisition

We gathered additional data from a variety of public databases to distinguish between exit and acquisition. 62 ASPs in our sample survived as of 2006. 16 of the ASPs were acquired prior to 2006. The descriptive statistics for the ASPs that exited the sample are presented in Table 5 below:

Table 5: Date of entry and exit

Date of entry or founding date	Total exits (excluding acquisitions)	Total acquisitions	Median date of exit	Number of ASPs that survived
Before 1994	4	3	2001	11
1995-1996	6	2	2001	8
1997	7	1	2003	5
1998	7	2	2002	12
1999	25	5	2004	10
2000	24	3	2002	16
Total	73	16		62

Conceptually, acquisition can be interpreted as an outcome of success since it could provide an ASP with visibility, access to partners and marketing resources (e.g., Thornton 1999). At the same time, an acquisition can be interpreted as an outcome of failure, when the purpose of the acquisition is merely to provide the acquirer with access to the assets held by the ASP, such as its investment in capacity. In that case, we could argue that exit due to business failure is a measure of failure, survival is an outcome of success and acquisition is more of a mixed outcome. To distinguish between exit due to acquisition from exit due to business failure, we coded the performance of the ASP along a three-point scale: exit, acquisition and continued survival. We then conducted an ordered logit of survival for the three-point scale including the hypothesized factors as well as alternate explanations from organizational ecology and the resource-based view, which can potentially create an omitted variables bias. We notice that the impact of misalignment is significantly negatively associated with the probability of survival and of acquisition. When comparing the resulting estimates in Table 6 below with those in column 3 of Table 5 of the main manuscript where the dependent variable is dichotomous, we observe that the direction and significance of the coefficients do not change except that the sign for the variable for market niche (the

coefficient is not significant, however), perhaps due to the differential impacts of the market benefits accruing from acquisitions. In other words, ASPs with a specialist focus could benefit more from acquisitions. The main results in our study remain unchanged; thus we have reason to believe that our results are not sensitive to the type of exit by the ASP.

Table 6: Ordered logit of exit, acquisition and survival

Variable	Probability
Intercept -Survival	-2.30 (1.55) *
Intercept -Acquisition	-2.00 (2.50)
Misalign	-1.36 (0.45) ***
Specialist	0.21 (0.15)*
Contract Length	0.18 (0.10)*
Service Uncertainty	-0.59 (0.22) ***
Tech. Cap	0.14 (0.20)
Continuity	0.14 (0.11)
Patent	1.35 (0.49) ***
Alliance	1.01 (0.53) **
Open standards	1.31 (0.68)**
Financial resources	0.39 (0.30) *
Founder education	-0.14 (0.20)
Prior Experience	0.25 (0.15)*
Age	0.09 (0.05)*
Log(Size)	0.13 (0.20)
Pseudo R-Square	0.39
Association*	81.3

* Denotes association between predicted probabilities and observed responses

6. Ruling out Adverse Selection Issues

The arguments developed in this paper highlight that the choice of contracts is driven by the incentives to the ASP and the degree of risk sharing inherent in the contract. The arguments for ex ante incentive alignment assume that the contract choice problem is that of a “hidden action” rather than a “hidden knowledge” type of scenario (e.g., Laffont and Martimort 2002: pp 3). As Chiappori and Salanie (2003) observe, adverse selection pre-exists the contract while moral hazard implies that agents’ behavior is a response to the incentive structure of the contract. Such adverse selection could potentially bias the causal arguments in this paper if ASPs opportunistically select contracts that ensure a grater likelihood of survival.

We address this issue in the following two ways. First, we examine whether there is self-selection in the relationship between contract choice and survival, described in the paper. Second, we need to examine alternate explanations for observed contract choices. Empirically, we cannot observe

whether the results relating to contract choice are driven by adverse selection. However, opportunism by the ASP can be potentially inferred by looking at post contractual behavior by the ASP. Prior literature suggests that if there is opportunistic behavior by the ASP, a cost based compensation scheme would lead the ASP to incur overruns in costs and schedule, i.e., the probability of contract choice and the probability of overruns are affiliated (e.g., Chiappori and Salanie 2003). On the other hand, if there is no opportunistic behavior by the ASP, contractual overruns are likely to be uncorrelated with the choice of contract. Following the precedent of empirical studies that test for asymmetric information (e.g., Chiappori and Salanie 2003) we conduct a bivariate probit estimation of contract choice and observed overruns on model variables. The presence of asymmetric information should cause a positive correlation between the two error terms. A two-tailed Chi Square test failed to reject the null hypotheses of no correlation. Therefore we can rule out bias due to the hidden type of ASP in our sample.

7. Theory and Operationalization of Niche Width

We build upon several theoretical definitions of *niche width* that distinguish between a generalist vs. a specialist approach anchoring upon prior work in sociology and strategy research. According to Carroll (1985): “Generalist organizations compete in a variety of domains simultaneously, whereas specialists focus on only one or a limited few” (Carroll, 1985: 1266). Podolny et al. (1996) posit that an organization’s fundamental niche is a function of its position in a technological space. According to Dobrev et al. (2001) specialists offer products with a small range of variation on the dimension of interest, and generalists display a broad range of products. Bruderl et al. (1992) differentiate between generalist organizations, which offer a wide array of products or services aiming at a broad range of customers, versus specialist organizations, that do not. To code a measure of *specialist*, therefore, we classified ASPs along the following three dimensions:

i. ASPs that are vertically specialized and provide a very narrow range of services, consistent with Carroll (1985).

ii. ASPs whose target market/ customer base is restricted to highly specific end user firms as posited by Dobrev et al. (2001), e.g., an ASP that supplies customized CRM services to hospitals.

iii. ASPs whose customer base is solicited only through referrals from partnership networks and whose marketing efforts were highly concentrated to a target customer base, also consistent with

the conceptualization of Dobrev et al. (2001). These ASPs constitute a sub-sample of the 9 ASPs that reported that their marketing efforts depend on targeted customer referrals.

The classification of ASPs along the above dimensions is presented in Table 7 below.

Table 7: Classification of Niche Width of ASPs in Our Sample

Characteristics of an ASP	Data Source for Coding this Measure	Number of firms
ASPs whose target customer base is highly specialized and therefore highly restricted.	Qualitative interviews with ASPs supplemented with archives and public databases	3
ASPs whose customer base is solicited through referrals from other customers and/ or partnerships with customers.	Qualitative interviews with ASPs	4
ASPs classified as vertical ASPs depending on the solution they offer.	Internet Archive, Qualitative Interviews and Public databases	76
Sub-sample of vertical ASPs that offer customized services to end users and homogeneous service offerings to a narrow target market.		14
Total number of ASPs classified as specialist		21

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