

A Risk Management Perspective of ASPs

Lloyd Brodsky

Department of Information Systems, Marketing, and Logistics
Free University
Amsterdam, Netherlands
Phone: 31-20-444-6059
Fax: 31-20-444-6005

Yao-Hua Tan

Department of Information Systems, Marketing, and Logistics
Free University
Amsterdam, Netherlands
Phone: 31-20-444-6057
Fax: 31-20-444-6005

Abstract

Application service providers (ASPs) provide access to application software over wide area networks and have been viewed as a means of making the benefits of outsourcing available to small businesses. However, many enterprise ASPs get the majority of their revenue from very large businesses while many vertical niche ASPs get their revenue from small businesses. We analyze this seeming anomaly from a risk management perspective. ASPs present a greater risk management problem to would-be customers than traditional outsourcing. We analyze the nature of the risk differences and then propose a model of how would-be customers process those risks. In our model, prospects first assess whether they can tolerate the worst case scenario and if they are able to do due diligence on the likely outcome. They consider benefits only if one of the previous assertions is true. The worst case scenario for enterprise applications is truly dire and only technologically sophisticated businesses are better able to identify the true risk profile. For vertical niche ASPs the worst case scenario is relatively mild, but economies of scale make the benefits relatively more appealing to small businesses.

Keywords

ASP, application service provider, risk, outsourcing

1. Introduction

Application service providers and web service providers are companies that rent the use of software applications over wide area networks. The literature about his business model tends to commingle four quite different value propositions:

- Financial (it is better to rent software than buy it)
- Outsourcing (companies should pay other companies to perform non-core functions)
- Cost (ASPs will be cheaper due to economies of specialization and scale)
- Increased fungibility (reduce the minimum quantity sold, making it affordable to small businesses)

- The literature is in its early stages of development and focuses on the development of taxonomies and applying traditional outsourcing theory to ASPs. (Bennett 2000, Bryson 2002, Currie 2000, Jayatilaka 2002, Patnayakuni 2001, Seltsikas 2002).

However, the business results did not meet the expectations of either the scholarly or popular press. US Internetworking (USi), the largest US ASP, has never been profitable and saw its stock price collapse from a high of US\$107.50 (March, 2000) to 20 cents, just before declaring bankruptcy in January, 2002 – a not atypical performance among stand-alone publicly traded ASPs. By way of comparison, Perot Systems is a traditional outsourcing firm that went public at about the same time and saw a price decline of only 50% over the same period. (CBS Marketwatch 2003)

More interestingly, there is a fascinating divergence in the average customer size of the ASPs that have achieved high levels of revenue. USi has 133 customers and US\$120 million in revenue (annualized) (USInternetworking 2001). Yahoo, whose electronic commerce hosting service would make it one of the largest ASPs if broken out, has 30 million in revenue and over 30,000 customers (Yahoo 2001). These two are hardly unique. Ebay (auction hosting) and McAfee (Network security) are two more high revenue ASPs with small customer sizes, while most of the other companies on ASP News' list of top ASPs follow the more traditional model of renting enterprise software to large companies. We refer to these as “enterprise” and “mass-market” ASPs.

The present study is exploratory and not meant as a systematic empirical survey of consumer segmentation of ASP customers. However, there seems to be enough information available to indicate a remarkable divergence in ASP customer bases. Most large ASPs can be divided into big customer and small customer camps.

The mass-market ASPs that attract mostly small company customers offer easy to understand and easy to install products whose function would be difficult to replicate without using an ASP and where the worst case scenario is tolerable even for small companies. For example, Yahoo Stores offers an electronic commerce hosting service with no customization available from Yahoo. It is easy for customers to confirm their store is working; financial transactions are handled by third parties, and plenty of competitors offer a similar service. It would be vastly more expensive for a small business to build a reliable in-house electronic commerce capability than to get the service from a third party. Because of the competition and perhaps the low proportion of revenue coming from on-line sales, a customer need have a disaster recovery plan.

The ASPs appealing to big companies offer highly complex and difficult to install products where the worst case scenario is catastrophic, such as Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM) systems. US Internetworking and Net Commerce Inc. are both financially troubled ASPs that have found that larger companies (in the 1 to 25 thousand employee range) have become the best customers, contrary to initial expectations. Here, the driving economic force has been the economies of scale from the ability to share the complex customization code needed to integrate complex applications with existing systems and the cost of managing complex multi-tier service centers. Their customers frequently had direct experience with the difficulties of maintaining enterprise applications, coupled with a sophisticated understanding of the underlying technology and finance. For example, one respondent reported that the *customers* often offered to pay for the software up front because they had a lower cost of capital than the ASP and did not want higher financing costs recovered in higher fees. This also meant that the customer would own

the software in the event of ASP termination and could use the depreciation deductions. These large companies have no difficulty affording the high speed network connections needed to get LAN-like responsiveness from ASPs. At Net Commerce, their largest non-government customer had its own internal ISP selling hosting services to individual business units. Thus, they had qualified people to do the due diligence. These large companies are not impressed by the economies of scale in the relatively simple mass-market applications.

The main question we try to answer in this paper is to explain how the market came to evolve this great divide between mass-market ASPs offering relatively simple products with a small company clientele and enterprise ASPs offering very complex products with a large company clientele. We found the most fruitful approach is a risk management perspective.

In this paper we investigate in detail the role that risk considerations can play in the process of a company deciding whether or not to use an ASP. In particular, we argue that the great divide in ASPs between small and big company customers could be explained in terms of reactions to risks not discussed in the earlier ASP literature. Firm size affects asymmetries in firms' ability to identify and manage those risks. For example, an ASP customer cannot determine if the performance will be acceptable until after the installation of the software application – a serious issue for small businesses that need to rely on slow Internet connections (sometimes even 56K modems!). Also, the business failure of an ASP can cause business disruption and permanent data loss if the ASP had not first made provisions for customer business continuity.

This work has four parts. First, we discuss the differences in the cash flow patterns of ASPs versus traditional outsourcers. Second, we catalog the differences in risks presented to customers and customers' ability to understand and mitigate those risks. Third, we define a proposed model of customer decision making and risk mitigation based on the Kahneman-Tversky theory of loss aversion and the Akerlof theory of information asymmetry. Finally, we identify relative successes and the industry lessons to be learned.

2. Differences between ASPs and Traditional Outsourcing

Traditional outsourcing does not have any technology of its own. It is “merely” a contractual relationship between a customer company and an outsourcing company for skilled labor services. The customer provides all the required capital equipment. After the negotiation is complete and the contract signed and funded, IT happens. The cash flow pattern of traditional outsourcers resembles that of consulting firms. Changing capacity is a relatively elastic matter of laying off or hiring employees for each customer gained or lost – and those employees are frequently transferred from new customers.

ASPs are quite different from both technological and financial points of view. ASPs commingle the contractual arrangements of outsourcing with the technology of distributed computing. They must contract for and staff operations centers before the first customer. They must also expend capital on buying or building software to be leased to their customers. Their financial structure looks much more like the high fixed costs of a telecommunications company than the low fixed costs of a consulting firm. If

there is insufficient aggregate demand, you shut the business down, even if some customers were happy.

3. Risks of the ASP Model

Providing services remotely carries some risks over and above the traditional IT problems of running systems on site. These additional problems include:

- **Wide Area Network (WAN) immaturity** WANs cost more per unit of bandwidth and have higher latency than local area networks (LANs).
- **Network outage risk** A public Internet connection has higher probability of intermittent failure than a LAN and is also subject to random slowdowns and hacker attacks
- **Business risk** The ASP could discontinue the service offering or even go out of business entirely
- **Monitoring risk** Confirming the level of effort specified in the service level agreement is harder due to resource sharing and remote operation.
- **Legal risk** The legal system has not yet adapted to the special problems of ASPs

We elaborate in the following sections.

3.1 WAN immaturity risk

The speed of a firm's Internet connection is likely to be much slower than that of its local area network (Schuff 2001). A typical LAN operates at a speed of 100 megabits per second, while a T1 connection (a common unit of sale of telecom bandwidth) is defined at 1.5 megabits per second – 1/67th the speed. A T3 approaches LAN speed (at 44 megabits per second), but these are expensive. Many small and medium enterprises rely on slower Digital Subscriber Line (DSL) or even dial-up connections and intend to share those connections with all the other Internet needs of the firm, not just for the ASP.

Customers care about the effective responsiveness of the application. The only way to be sure that a particular application will perform adequately is to install it and try to use it under realistic volume test. This is possible for simple “shrink-wrapped” applications, but it is not practical to try out, say, an Enterprise Resource Planning application for a week because of the difficulty in importing data and configuring the software.

3.2 Network outage risk

In addition, there is a continuing risk of random service outages and random slowdowns in the network connection. Any interruption in the customer's or the ASP's Internet services means a total loss of service, possibly idling staff and turning away the customers' customers. While uptime can be increased by buying redundant connections from different ISPs, this is expensive.

3.3 Business risk

As discussed in the introduction, business problems at the ASP have the potential to cause catastrophic problems for the customer. The business risk issues include:

- **Service discontinuation:** A business may simply discontinue the service. This even happens with financially reliable companies such as SAP and Intel, whose joint venture Pandesic was shut down (ElectronicCommerceNews 2000). This will cause significant dislocation unless the software and data can be transferred to another ASP or in-house.
- **Insolvency outages:** One of the businesses in the service provision value chain may simply run out of money and cease operation. Unfortunately, ASPs with serious money problems have an interest in hiding their condition from customers. This is more than a theoretical possibility. It was not possible to apply for a job at Sears Roebuck's website for several weeks when the ASP servicing its human resources department went under (Harrington 2001). Thousands of people lost their DSL connections without when Northpoint Communications went under (Ulfelder 2002). The Gartner Group has estimated that 60% of all ASPs will terminate by the end of 2001 (Correia 2001, MacDonald 2001, Terdiman 2001). Data could be lost forever without a continuity plan.

3.4 Monitoring risk

In traditional outsourcing contracts, the customer pays for a specified number of people, who are billed at a mark-up. ASP contracts typically specify a service level, not a resource level. A customer cannot easily observe if the ASP has acquired sufficient resources to meet all of its service commitments or its priority if the ASP has cut back.

3.5 Legal risk

It takes time to develop stable usable standard contracts for new distribution channels. In addition ASPs frequently deal in application areas where customers would like the privacy and financial protections available by default to bank and public utility customers. ASP customers do not have those protections unless they have been negotiated into the service level agreement. However, the cost of that contracting will be relatively high because of the lack of standardized legal language found acceptable by courts. Before that happens, contracts are relatively uncertain and require scarce expertise and custom legal research to write.

In addition there are potential problems with the bankruptcy laws. If legal bankruptcy is declared, the customer's data might be viewed as part of the ASP's assets available to satisfy creditors. There will also be the practical problem of access to that data if the company has laid off most of the staff or terminated operations.

4. Risk Management – literature review

The risks identified above are typical for ASPs and are in addition to the risks of traditional outsourcing. There is a literature of risk management in outsourcing, but that deals with *perceived* risk, not actual risk (see below). We turn to economics for theoretical guidance on how these risks might affect ASP purchase decisions. There are three specific areas which are relevant: incomplete insurance markets, incomplete information, and risk aversion. We discuss these in turn:

- **Inability to “insure” against network and business risk is an instance of an incomplete market for state-contingent risks.** You might be disinclined to buy a house if flood insurance were unavailable – especially if it were located in a flood

plain. The existence of bonding (a financial guarantee of performance from a trusted third party) also sends important signals about reliability – imagine a bid from an unbonded contractor, especially compared with bids from bonded contractors. In this case prospects may wish to insure against a business disruption from network outages or an ASP termination of service. Unfortunately, the ASP industry has not yet developed any bonding or independent monitoring mechanisms, so potential customers need to be able to absorb those losses. The ASPs themselves could pre-empt many of these customer concerns by arranging for off-site backups and alternative hosting, but they cannot replace the informational value of a third-party guarantee.

- **Inability to determine if vendors are truthful is an instance of asymmetric information resulting in a kind of adverse selection:** Any ASP will know more about its true financial condition, its technical reliability, and the expected complexity of software installation than any potential customer. There is a sizable line of economic theory beginning with the celebrated Akerlof lemons paper (Akerlof 1970) that suggests the equilibrium outcome when sellers have information that the prospects don't is for people offering a quality product to be driven out by lying vendors. This is known as adverse selection. In our situation, this suggests prospects walk away from deals which would have been accepted if the vendor had been able to prove its ability to perform. We also suggest that the decrease in expectations due to asymmetric information varies with the customer, with larger customers having better information than small businesses.
- Akerlof also demonstrated that the market failure could be mitigated by permitting trusted third parties to examine the goods, with the equilibrium price being fair market value less the third party monitor's fee. This exacerbates the effect of insurance unavailability discussed above.
- **Loss aversion and the certainty effect:** Cognitive research into how people reason about uncertainty has demonstrated some persistent distortions that affect markets. People are much more averse to risky losses than they are to risky gains. In other words, when faced with two risky positive alternatives of which one is better than the other people tend to choose the less risky one, whereas it is exactly the opposite for pairs of negative alternatives. (Kahneman 1982, Kahneman 1979, Kahneman 1995) Further, people are willing to pay much more for contingently certain outcomes (Viscusi 2000) (if X happens, you get Y) than probabilistic ones (if you do X, Y is k% less likely). These distortions interact with and exacerbate the problems of incomplete insurance markets and asymmetric information. The inability to insure causes more fear-related loss-averse decision making than is economically justified. Market experiments in the presence of asymmetric valuations demonstrate that far fewer transactions take place than economic theory would predict. (Kahneman 1991). These cognitive distortions create a powerful bias towards the status quo.

5. A Risk Management Model

When one or more of these three effects are present, it is possible the distortions would overwhelm a positive expected payoff. There are three reasons why somebody would buy in this situation:

- **Due Diligence:** Due diligence is the diligent evaluation of evidence by skilled people. It implies you can form detailed questions, the ability to analyze evidence, and the negotiating clout to get the vendor to cooperate with the investigation. The investigation cost will be relatively invariant to the quantity demanded. Thus, due diligence is most commonly associated with large companies. It would take place after the customer has *prima facie* evidence of the soundness of the basic value proposition – but still needs to confirm the facts and accurately assess the risks.
- **Trust:** Trust is the willingness to buy without due diligence because you have information which *indirectly* confirms the company's claims – perhaps the recommendation of a trusted third party or a history of being a successful business. It is difficult for unprofitable new capital-intensive companies to convince others to trust them. That's one of the reasons why having initial well-known customers or favorable coverage by a trusted third party such as Gartner or Dun & Bradstreet can be a turning point in firm outcome. Trust is frequently earned with time, as a history of business success suggests the same for the future and leave behind a trail of references and reputation.
- **Faith:** The acceptance of a firm's value proposition in the absence of any convincing evidence. Faith is something rare and precious, but it can also be a positive new present value deal for somebody building a portfolio of promising but unproven information technologies.

From this framework we hypothesize that the process of selecting and using an ASP involves the following 5 phases:

- **Editing:** Creating an initial list of alternatives to be evaluated. We suggest that IT service buyers only assess the benefits of solutions considered “safe enough”. In this phase many prospects reject ASP services with a positive expected return due to loss-averse decision making. This opting-out behavior will be much more prevalent among small companies than larger ones because of their greater information asymmetry.
- **Evaluating:** Actually conducting the evaluation, whether by due diligence, looking for trust information, or by a leap of faith. We believe that in this phase an absence of trust and/or verifiable information will reduce the apparent value of the initial ASP offer, perhaps to the point of rejection. We also believe that some specific kinds of applications (such as electronic commerce for small business) will have sufficiently dominating benefits to overpower the asymmetries and the cognitive distortions. An important issue here will be whether the application's installation costs are low enough that it can be evaluated on-site.
- **Negotiating contingencies:** Some deals might be acceptable if the worst case situation under a specific information asymmetry between the ASP and the potential customer can be ruled out by negotiating contracts with verifiable actions. For example, the ASP could agree to off-site backups and license transfers in the event of termination. However, these negotiations require expert skills in understanding the risks and formulating the right type of contracts. These skills are typically available only at large companies that can afford the legal costs and the overhead of outsourcing contract specialists. Furthermore, only a subset of companies will be big enough prospects to induce the ASP to negotiate.

- **Monitoring:** If the ASP agrees to the revised deal, the deal goes forward and the customer expends effort monitoring the deal and perhaps exercising one or more of the options. Again this monitoring requires expertise to know the early warning signals of troubled operation. Again this typically is the kind of skill found in professional outsourcing contract managers, usually not found in small companies.
- **Enforcement** actions to enforce any deviations from contract. Only large companies can afford to litigate.

We think these observations explain the great divide between the average customer sizes of the ASPs serving these two utterly different market segments. Also it explains why these two types of ASPs offer completely different services for their respective customers. The large companies are likely to have the resources to do due diligence and only they will accept the more complex, difficult-to-verify ASP services – CRM and ERP systems have a small benefit per transaction, so they naturally appeal to large companies. Small companies will prefer non-mission-critical easy-to-verify systems where economies of scale almost mandate outsourcing – hence the popularity of web hosting and Internet security as small business ASP services.

Based on these observations we hypothesize that, due to differences in technical/legal sophistication and negotiating clout, small companies buy ASP services when:

The ASP approach economically dominates alternatives and this is most likely to happen with applications that intrinsically involve the Internet, as in electronic commerce hosting:

- It is easy to install the application and confirm that it is working
- The application can be easily switched to another ASP
- The application is not mission-critical, limiting loss

Further hypotheses that follow from our analysis are the following:

First, we identified a number of negative factors about providing application services over wide area networks:

- User interface was negatively affected by the slower speed of wide area networks, which resulted in some applications having unacceptable performance
- Wide area networks have technical outages more frequently than local area networks, making ASP unacceptable for some real-time mission-critical applications
- Limited availability of low-end broadband, coupled the difficulty of installation and the prevalence of finance-caused no-warning shutdowns of DSL providers prevented many small businesses from buying

Second, we identified the possibility of ASPs terminating services for business reasons and demonstrated how this would cause a disaster if there had not been provision for transferring data *as well as* software to either insource hosting or another ASP. We hypothesized:

- Many ASPs will not freely disclose the true state of their finances when this would discourage purchase

- Prospective customers can neither easily determine the true state of an ASPs finances or technical reliability nor the reliability of its own Internet provider
- Companies will have a more serious reaction to the possibility of a catastrophic loss than is justified by the actual probability
- Customers' inability to have a disaster recovery plan will negatively affect sales
- Concern about ASP shutdowns increased as the rate of ASP bankruptcies increased
- ASPs that do enable disaster recovery for their clients find it easier to establish trust
- ASPs which are owned by financially stable companies find it easier to establish trust than stand-alone ASPs

One limitation of our analysis is that it is exploratory. Clearly, when more data about ASPs (and their failures!) become available, these hypotheses should be tested in a systematic empirical study.

It's useful to compare this reasoning to existing research on risk in ASPs specifically and outsourcing generally. There is a lack of consensus on a precise definition of ASPs and how they compare to other emerging forms of remote outsourcing, such as web services and grid computing. This definitional confusion and the volatility of the marketplace complicate the empirical task. For example, at the ASP track at HICSS 2002 Seltsikas 2002 and Bryson 2002 explicitly dealt with ASP bankruptcy while Jayatilaka 2002 referred to "explosive growth" – although the two latter papers cited the same Gartner Group report predicting that as much as 60% of ASPs would fail by the end of 2001 (Terdiman 2002). Bryson explicitly identifies ASP risk items and risk prevention/resolution actions, although not in the context of specific patterns of outcomes of ASPs. Kern, Lacity & Willcocks (2000a & 2000b) explicitly identify risk dimensions for enterprise ASPs.

There is a literature in risk management of outsourcing but it is important to understand that risk means something much more diffuse in this literature stream. Rather than an actuarial calculation involving a probability distribution and a risk aversion function, the outsourcing literature stream involves case method and survey research among IT managers on possible bad outcomes, risk factors, and risk avoidance strategies.

There are good reasons for this in traditional outsourcing, whose deals "display a stunning diversity in their objectives and their structure" according to Gurbaxani (1996). Because these contracts are intended to define how large complex portfolios of information technology needs will be met over a period of years it is not even possible to precisely define the objectives, let alone the means of meeting those objectives. In most cases the risks involved in these outsourcing projects are related to general management issues and of a more diffuse nature than the typical ASP technology risks that were identified in this paper. Even if those contracts were so defined, it would be a challenge to compare them across companies.

Thus, the studies of outsourcing risk study *perceived* risk of consulting tasks, not the statistical probability of technological failure or its economic consequences (Hirscheim 2000). These risk studies focus on the magnitude of a negative consequence of a decision (Bahli 2001). These negative consequences are generally acknowledged to be cost escalation (paying more than expected) and service debasement (services received

are of lower quality than expected). Bahli 2001 identifies lock-in, costly contractual amendments, unexpected transition & management costs, and disputes & litigation as relatively specific negative outcomes to be avoided. Kern, Lacity, & Willcocks (2002a & 2002b) explicitly identified an extensive list of risk factors in ASPs, but their study was limited to what we call enterprise ASPs. Their list adds security breaches, oversold capability, supplier subcontracting, and unrealistic customer expectations to our list. Schwartz & Zozaya-Goro (2003) developed a real options model with three stochastic processes representing cost, revenue, and catastrophic failure which maps well to our analysis, but was focused on new project selection and not on service provision.

6. Summary

In this paper we argued there are risks in the ASP model not previously addressed in the literature. We showed how these ASP risks could explain the customer size and type-of-service divide within the ASP community. The large companies are likely to accept the more complex, difficult-to-verify ASP services such as CRM and ERP. Small companies tend to prefer non-mission-critical easy-to-verify systems where economies of scale almost mandate outsourcing – hence the popularity of web hosting and Internet security as small business ASP services. We have argued that potential customers for ASP services follow a decision-making processes parallel to those suggested by Kahneman-Tversky and Akerlof and that those processes may have screened out most trade. Finally, we identified some characteristics of market niches likely to be found acceptable and that could help prospective ASPs to better market their services.

References

- Akerlof, G (1970), ‘The Market for “Lemons”’: Qualitative Uncertainty and the Market Mechanism’, *Quarterly Journal of Economics*, vol. 84, no. 3, pp. 488-500.
- Bahli, B and Rivard, S (2001), ‘An Assessment of Information Technology Outsourcing Risk’, *Proceedings of International Conference of Information Systems*, viewed March 26, 2003, http://aisel.isworld.org/proceeding_password.asp?Vpath=ICIS/2001&PDFpath=01RIP27.pdf.
- Bennett, C and Timbrell, G (2000), ‘Application Service Providers: Will They Succeed?’, *Information Systems Frontiers*, vol. 2, no. 2, pp. 195-211.
- Bryson, K and Sullivan, WE, (2002), ‘Designing Effective Incentive-Oriented Outsourcing Contracts for ERP Systems’, in *Proceedings of 33rd Hawaii International Conference on System Sciences*, IEEE Computer Society Press, Los Alamitos.
- Correia, J (2001), ‘Sanity Check on the ASP Opportunity’, Gartner note OMAS-WW-DP-0101, Resource ID 325792, viewed March 27, 2003, http://www4.gartner.com/DisplayDocument?id=325792&ref=g_search.
- Currie, W and Seltikas, P, (2000), ‘Evaluating the Application Service Provider (ASP) Business Model Executive Publication Series CSIS2000/004’, Brunel University Centre For Strategic Information Systems, Brunel.
- Electronic Commerce News* (2000), ‘Pioneering ASP Closes Shop’ vol. 5, no. 31, pp. 1.

- Gurbaxani, Vijay, (July, 1996), 'The New World of Information Technology Outsourcing', *Communications of the Association for Computing Machinery*, vol. 39, no. 7, pp. 45.
- Harrington, A, (2001), 'Don't Get Stung by an ASP!', *Fortune*, vol. 143, no. 11, pp. 190.
- Hirscheim, Rudy and Lacity, Mary, (Feb, 2000), 'The Myths and Realities of Information Technology Insourcing', *Communications of the Association for Computing Machinery*, vol. 43, no. 2, pp. 99.
- Jayatilaka, B, Schwarz, A, and Hirscheim, R, (2002), 'Determinants of ASP Choice: An Integrated Perspective, in *Proceedings of 33rd Hawaii International Conference on System Sciences*, IEEE Computer Society Press, Los Alamitos.
- Kahneman, D, Knetsch, JL, and Thaler, RH, (1991), 'The Endowment Effect, Loss Aversion, and the Status Quo Bias', *Journal of Economic Perspectives*, vol. 5, pp. 193-206.
- Kahneman, D, Slovic, P, and Tversky, A (1982), *Judgment under Uncertainty: Heuristics and Biases*, Cambridge University Press, Cambridge.
- Kahneman, D and Tversky, A, (1979), 'Prospect Theory: An Analysis of Decision Under Risk', *Econometrica*, vol. 47, no. 2, pp. 263-91.
- Kahneman, D and Tversky, A, (1995), 'Conflict Resolution: A Cognitive Perspective', in *Barriers to Conflict Resolution* Arrow, K, Mnookin, RH, Ross, L, Tversky, A and Wilson W eds, WW Norton & Company, London.
- Kern, T, Lacity, M, and Willcocks, L, (2002a), 'Application Service Provision: Risk Assessment and Mitigation', *MIS Quarterly Executive*, vol. 1, no. 2, pp. 116-126, viewed March 27, 2003, <<http://www.misqe.org/V0102-06.pdf>>.
- Kern, T, Lacity, M, and Willcocks, L, (2002b) *Netsourcing: Renting Business Applications and Services Over a Network*, Financial Times Prentice-Hall, Upper Saddle River.
- MacDonald, N, (2001), 'Dot-Coms Implode, but Failing ASPs Create a Domino Effect', Com-13-0402 Resource ID 324710, viewed March 27, 2003 at http://www4.gartner.com/DisplayDocument?id=324710&ref=g_search.
- Patnayakuni, R and Seth, N, (2001), 'Why License When You Can Rent? Risks and Rewards of the Application Service Provider Model', *Proceedings of the 2001 ACM SIGCPR conference on computer personnel research*, pp. 182-188, Association for Computing Machinery, New York.
- Schwartz, ES and Zozaya-Goro, C (2003), 'Investment Under Uncertainty in Information Technology: Acquisition and Development Projects', *Management Science*, vol. 49, no. 1, pp. 57-70.
- Seltsikas, Philip, and Currie, Wendy L (2002), 'Evaluating the Application Service Provider (ASP) Business Model: The Challenge of Integration', in *Proceedings of 33rd Hawaii International Conference on System Sciences*, IEEE Computer Society Press, Los Alamitos.

- Schuff, D and St Louis, R, (June, 2001) 'Centralization vs. Decentralization of Application Software', *Communications of the Association of Computing Machinery*, vol. 12, no. 1, pp.88-94.
- Terdiman, R (2001), 'ASP Market: Controlled Chaos or Free-For-All', Gartner Group, Note #COM-09-9886, Reference ID: 295660, viewed March 27, 2003, <http://www4.gartner.com/DisplayDocument?id=295660&ref=g_search>.
- Ulfelder, S, (2002), 'The DLEC's Demise', *Network World*, vol. 19, no. 1, pp. 34-36.
- Viscusi, WK, Magat, WA, and Huber, JC, (2000), 'An Investigation of the Rationality of Consumer Valuations of Multiple Health Risks', *Rand Journal of Economics*, vol. 18, no. 4, pp. 465-79.
- US Internetworking, Inc (2001), 'Form 10-Q for quarter ended September 30, 2001', Washington, DC: United States Securities and Exchange Commission, viewed March 27, 2003, <http://edgar.sec.gov/Archives/edgar/data/1076732/000095013301503310/w55047e10-q.htm>.
- CBS Marketwatch (2003), viewed on March 27, 2003, <<http://cbs.marketwatch.com/tools/quotes/profile.asp?symb=USIQE&sid=146102&siteid=mktw>>.
- Yahoo, Inc (2001), 'Form 10-Q for quarter ended June 30, 2001', United States Securities and Exchange Commission, viewed March 27, 2003, <http://edgar.sec.gov/Archives/edgar/data/1011006/000110465901501390/j1310_10q.htm>.