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The Next Phase of IT Outsourcing – Utility Computing: Understanding Utility Computing Acceptance

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ABSTRACT

Information Technology (IT) outsourcing is a major issue facing IT management. IT outsourcing has evolved from outsourcing IT functions externally, to Application Service Provider's (ASP's) and now to the next phase of IT outsourcing: *utility computing* (UC). UC as defined in this research turns computing infrastructure into a flexible, on demand pay per use service.

Drawing on theories in trust, production economics, IT chargeback, transaction cost economics, and business strategy, this research proposes a conceptual model, in which UC providers' trustworthiness, budgeting advantages, transaction costs, and organization strategies are identified as the salient antecedents of UC acceptance. This research is one of the first to examine the antecedents of UC acceptance and could provide early insights for potential UC adopter firms and UC providers.

KEYWORDS

Utility Computing, Transaction Cost Economics, Production Economics, Chargeback, IT outsourcing, Trust.

INTRODUCTION

Information Technology (IT) outsourcing is a major issue facing IT management. IT outsourcing has traditionally been used to satisfy IT managers requests to control IT costs, provide access to new technology and expertise, reduce IT risk, focus on core competencies and more directly correlate IT spending with business returns (Ganek and Corbi, 2003; Jurison 1995). Information technology outsourcing has evolved from outsourcing IT functions externally, to Application Service Provider's (ASP's) and now to the next phase of IT outsourcing: *utility computing* (UC).

Definition of UC

Due to the recent development of the technology and process, a clear and generally accepted definition of UC has not emerged, and is expected to become clearer as it matures (Greenemeier, 2003; Shankland, 2003). However, the industry vision for UC is for computing power to be delivered over the Internet as a pay-as-you-go service similar to electricity or water (Ross and Westerman, 2004). The firm will be provided the flexibility to purchase processing power, server capacity, storage, desktop services and applications over the Internet on demand.

Motivation for the Study

By using UC, firms could save money by only purchasing what they need and when they need it, rather then investing in underutilized expensive IT equipment and personnel. Recent technological advancements have made UC an attractive IT infrastructure option. The reduced costs of bandwidth, advances in distributed content and application development architectures and advances in server and storage virtualization have all contributed to the development of the UC alternative.

UC is well suited to the current economic climate, where CIO's are wary of earmarking any additional funds to IT. IT management concerns are focused on correlating IT spending with business returns, reducing IT investment, IT risk and the resources associated with maintaining excess IT capacity (Spooner, 2002). Early outsourcers are becoming discontent with their fixed price outsourcing arrangements and feel these inflexible arrangements do not reflect today's cost structures, pricing, and market environment (Lacity and Willcocks, 1998). UC provides the flexibility to address the current system

underutilization, and inflexible installations that are burdening today's firms by more directly matching IT expenses to revenues.

Forrester Research has predicted that UC will be the 3rd major computing revolution, behind mainframes and the Internet (Hamm, 2003). In addition, Gartner predicts the market for UC will increase from $8.6 billion in 2004 to over $25 billion in 2006, and by the year 2006, 30% of companies will have a UC agreement (Bednarz and Dubie, 2003). UC could cut computing power and capacity costs by 30%, compared to in-house managed infrastructure (Frauenheim, 2003). It has been suggested that a relationship that aims to achieve IT efficiency by tapping into vendors with large resource pools may be better managed in a pay-per-service relationship (Levina and Ross, 2003). Thus, UC has the potential to revolutionize the use of IT (Garvey, 2000). However, there is little published research available on the factors that may contribute to the acceptance of UC in organizations. To address this gap, the research question in this paper is formulated as the identification of salient antecedents of UC acceptance.

This research is one of the first to examine the antecedents of UC acceptance. The results could provide an early insight in UC adoption for potential adopter firms as well as UC providers. Drawing on theories in trust, production economics, IT chargeback, transaction cost economics, and business strategy, this research develops a conceptual model for salient factors that contribute to the acceptance of UC as a firm's IT infrastructure.

Comparison Between IT Outsourcing, ASP, and UC

In understanding the acceptance of UC, it is important to compare its features with those of IT outsourcing and ASP, as reported in Table 1. IT outsourcing has been defined as the handing over to a third party the management of IT/IS assets, resources and activities (Nam, Srinivasan, and Chaudhury, 1996; Willcocks and Lacity, 1995), and ASP as defined by the ASP Consortium refers to an organization that manages and delivers application capabilities to multiple entities from a data center across a wide area network. UC extends the ASP model to include the infrastructure resources needed to run the ASP-delivered applications (Chordas 2003). It has been reported that the ASP model failed to attract a large customer base, which is essential for long-term survival (Susarla, Barua and Whinston, 2003). In providing greater IT agility for organizations, the antecedents for accepting UC must be established to prevent the limited satisfaction and acceptance that has occurred with ASP services.

	IT Outsourcing	ASP's	Utility Computing
Description	Outsource IT resources	Outsource application operation and maintenance	Subscribe to IT infrastructure on demand
Analogous to	Contract labor	Equipment leasing	Electrical power
Buyer	CEOs/CIOs	CIOs	CIO/Managers
Sellers	Traditional IT outsourcing firms	ASP vendors	Leading vendors (IBM, Sun Microsystems, Hewlett Packard)
Product	IT resources	Application hosting	IT-based business functions
Cost	High – limited leverage over pricing and productivity	Medium – marginal cost savings over self-hosted	Low – pay only for consumption, leverages shared resources
Benefits	Reduced complexity	Marginally reduced costs	Reduced complexity, costs, increased responsiveness
Risk	Medium – large and stable service providers	High –immature market with failing providers	Medium – immature market but model limits financial exposure
Flexibility	Low – all or nothing	Low – contract limits	High – flexible as the users ability to switch providers
Scalability	Low – vendors interested in large contracts	Low – license terms determine	High – functionality and users adjustable on demand
History	Long, mixed results	Short, few positive experiences	New, learning from history
*Adapted from Eriksen (2003)			

Table 1. IT Outsourcing, ASP, and Utility Computing Comparisons

UTILITY COMPUTING ACCPETANCE MODEL (UCAM)

Literature has called for determining how to enable users to exploit the availability of on demand resources and services provided through UC (Ross and Westerman 2004). The development of the UC Acceptance Model (UCAM) provides an early framework for understanding the salient factors that contribute to the acceptance of UC as the firm's IT infrastructure source. This insight will be beneficial for both UC adopting and providing firms in guiding their future UC related activities. In the conceptualization of the UCAM, we identify four categories of salient antecedents that have been shown to influence the IT outsourcing and UC decision. These categories include: UC providers' trustworthiness, UC budgeting advantages, UC transaction costs, and business strategies (Figure 1). Table 2 contains the definition of constructs and references used for scale development. The remainder of this paper discusses the theoretical development of the UCAM.

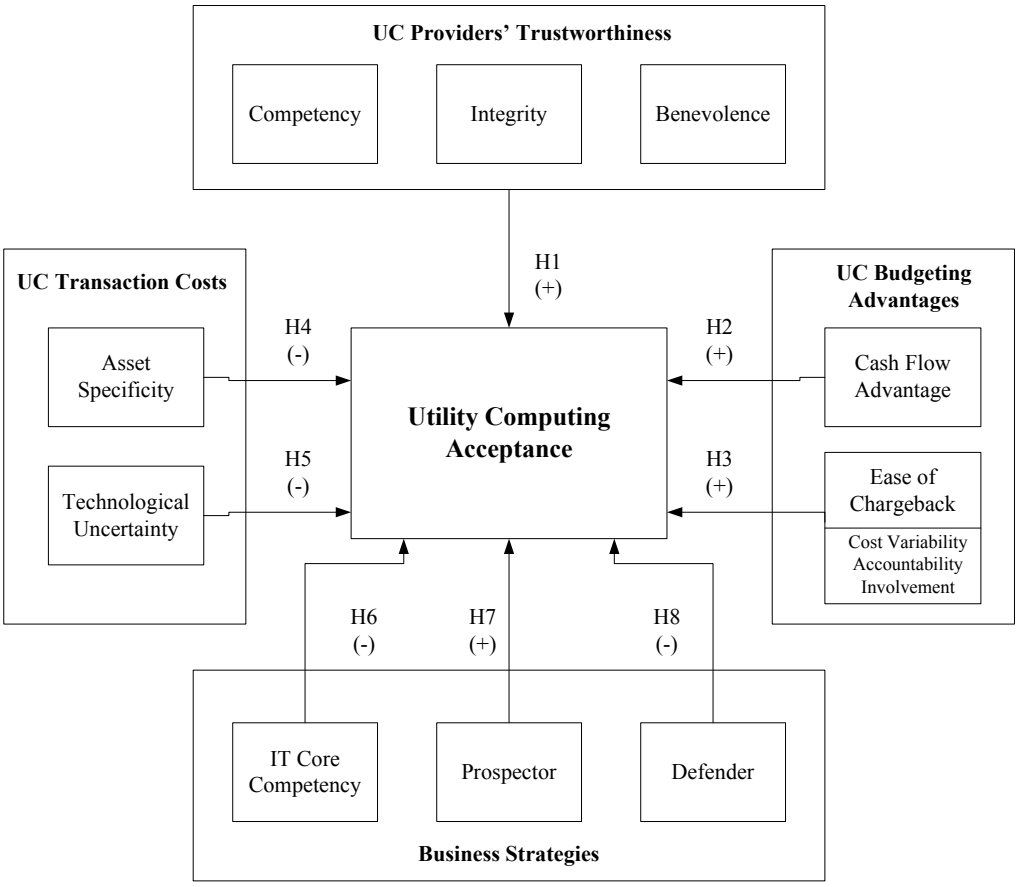

Figure 1. Utility Computing Acceptance Model (UCAM)

UC Providers' Trustworthiness

Despite the anticipated benefits and expected growth of UC, many potential UC adopters are wary of the promises being made by UC providers. A number of CIO's interviewed found UC intriguing, but stated that they remain skeptical of UC delivering what it promises (Bates, Davis and Haynes, 2003), suggesting the firms' views about trustworthiness of the UC provider to be a critical factor in UC acceptance. Trustworthiness has been shown to have a significant role in business relationships, particularly under uncertain conditions (Ba and Pavlou, 2002; McKnight, Choudhury, and Kacmar, 2002; Song and Zahedi 2003). Trustworthiness as a second-order construct has three dimensions: ability, benevolence and integrity (McKnight et. al 2002). In following Song and Zahedi (2003), we consider the trustworthiness beliefs in the UC provider as the beliefs that the UC provider is able to provide IT infrastructure through UC (ability), willing to act in the best interests of the UC customer (benevolence) and is honest in their promises of UC (integrity) in providing business critical IT infrastructure. We expect that:

> ***Hypothesis 1:*** *A UC customers' trustworthiness beliefs for the UC provider will have a positive effect on their likelihood of UC acceptance.*

Constructs	Operational Definition	Sources for Item Development
Utility Computing Acceptance	Acceptance of UC to provide all or part of a firm's IT infrastructure.	New scale developed
UC Providers' Trustworthiness	Refers to the UC customers' perceptions of the UC provider's knowledge, competence, care and honesty regarding UC.	Bhattacherjee (2002) Jarvenpaa et al. (1998) Mayer and Davis (1999) McKnight et al. (2002) Song and Zahedi (2003)
Cash Flow Advantage	Degree to which UC is perceived to lower IT infrastructure costs.	Ang and Cummings (1997) Ang and Straub (1998)
Ease of Chargeback	Ease of IT chargeback system allocating IT costs to various IT projects within the firm.	Bergeron (1986)
Asset Specificity	Refers to the uniqueness of skills, business knowledge, human capital and technology required for completing the UC transaction.	Ang and Straub (1998) Wang (2002)
Technological Uncertainty	The perceived technological uncertainty and business risks related to UC as compared to other alternatives.	Ang & Cummings (1997)
Strategic Orientation	The Miles and Snow (1978) strategic classification of prospector or defender will be used to analyze UC acceptance. Regarding IT operations prospectors typically desire for flexibility and innovation while defenders typically emphasize cost containment.	McKee et al. (1989) Saberwal and Chan (2001)
IT Core Competency	IT competence of the firm, operationalized as the influence, strength and value of IT functions.	Jarvenpaa and Ives (1991) Nam et at (1996)

Table 2. Definition and Operationalization of Constructs

UC Budgeting Advantages

UC provides a number of budgetary and financial advantages for organizations, the most important of which are cash flow advantages and ease of chargeback.

Cash Flow Advantages

The cash flow advantage for UC has been a major reason given for the acceptance of UC. In today's cost cutting environment IT managers are continuously looking for ways to cut IT costs. UC providers promise cost savings based on their variable on-demand pricing approach. We conceptualize the cash flow advantage for UC by relying on neoclassical economics.

Neoclassical economics, by definition, regards any business organization as a production function motivated by profit maximization (Williamson, 1981). Organizations are thought to provide goods and services to markets where they have cost advantages, and to rely on the marketplace for goods and services, in which the market has comparative cost advantages (Williamson, 1981). Firms outsource IT to attain the production cost advantages from the assumed economies of scale and scope possessed by the outsourcing providers. Prior research has shown that production costs influence the decision to outsource (Ang and Cummings, 1997; Ang and Straub, 1998; Jurison, 1995; Loh and Venkatraman, 1992). In this study, production costs refers to the costs for internally or externally producing, operating and managing IT infrastructure. Firms may opt for internal sourcing when they perceive transaction diseconomies to override any production cost advantages in market exchanges (Bakos and Brynjolfsson, 1993). Production costs for UC consist of the pay-per-use method of payment for the IT infrastructure services tendered. It has been argued that organizations would be better served to purchase their computing infrastructure based on usage (Bates, Davis and Haynes, 2003).

UC will require extensive contracts and agreements regarding usage and security, which may limit their acceptance. Furthermore, the economies of scale and scope argument would predict that outsourcing has little to offer larger firms,

because they can generate economies of scale and scope internally by reproducing the production methods used by vendors (Levina and Ross, 2003). Nevertheless, the data on UC usage indicates that many large firms are turning to UC for their IT infrastructure needs (Boulton 2003, Greenemeier, 2003). Even though the large firms may have the IT resources to produce their own IT infrastructure, they perceive that UC can still provide the firm IT decision flexibility and performance efficiency that reflects in cash flow advantages. These arguments suggest:

> ***Hypothesis 2:*** *The higher the perceived UC comparative cash flow advantages for the firm, the higher the likelihood of UC acceptance.*

Ease of Chargeback

Management and scholars have been struggling to specify the underlying mechanisms linking IT infrastructure investments to financial performance (Bharadwaj, 2000). There has been an inability to clearly demonstrate IT investment's direct impact on the bottom line (King, 1994). IT chargeback has been identified as one method for linking IT investment to financial performance. IT chargeback is defined as an accounting method in which businesses allocate and trace IT costs among projects (Bergeron, 1986). The increased pressures for expanding IT infrastructure alone with the need to minimize costs spent on information technology has heightened the demand for chargeback systems that can support effective IT investment decisions that link IT costs with usage (Ross, Vitale, and Mathis-Beath, 1999).

IT chargeback literature emphasizes the importance of a system that can report usage based charges, control costs, and provide understandable bills that can be used in effective decision making (Allen, 1987; Hufnagel and Birnberg, 1989; Ross et al., 1999;). Management will be able to use the UC billing data to set up departmental chargebacks and set budgets for business initiatives with computing factored in as a known cost of doing business. Information technology spending will therefore be directly connected to maximizing the strategic business value of information technology (Sueltz 2003).

In a study of chargeback system characteristics, Bergeron (1986) reported that cost variability (measure of the extent to which charges are variable as opposed to fixed), accountability (extent to which user managers are held responsible by their superior for meeting their data processing budget) and involvement (extent to which the user manager participates in budget preparation prior to budget approval) were good predictors of use. UC can serve as the process to address the concerns and requirements for an effective chargeback procedure by (1) addressing management's desires to turn IT infrastructure into a variable cost based on usage (cost variability), (2) providing reports and tools required to identify who is consuming the computing resources for more accurate charges (accountability), and (3) allowing management to be heavily involved and better informed in the budgeting process of information technology since IT can now be factored in as a known cost of doing business (involvement). Hence, ease of chargeback for IT usage is a second-order construct that has three dimensions of: cost variability, accountability and involvement (Hufnagel and Birnberg, 1989). Thus we expect that:

> ***Hypothesis 3:*** *The greater the importance of ease of chargeback for IT usage in the firm's budgeting process, the higher the likelihood of UC acceptance.*

UC Transaction Costs

Transaction cost theory posits that there are transaction costs in using the market governance structure (Williamson, 1981). TCT identifies three salient constructs in deciding the governance decisions for a firm: asset specificity, uncertainty, and frequency. While the first two constructs have direct applications in UC acceptance, the frequency construct is part of the IT core competency discussion, which will be presented later.

Asset Specificity

Asset specificity as described in TCT refers to the degree to which an asset can be redeployed to alternative uses by alternative users without sacrifice of productive value (Williamson, 1981). Transactions with high asset specificity tend to be designed for long term continuous relationships since the high amount of customizations and dedicated human capital required may result in high switching costs resulting in little or no value if the contract terminates prematurely (Jurison, 1995; Nam et al., 1996; Wang, 2002; Williamson, 1981). Specific assets cause problems in the outsourcing decision because the firm's continued use depends on the good faith behavior by the service provider. Firms are exposed to the possibility of opportunistic behavior of the service provider. To safeguard against this risk, additional monitoring and enforcement measures are required to protect the outsourcing firm. These increased transaction costs negate the benefits of outsourcing their IT services. Prior research has indicated that the greater the specificity associated with IS assets, the lower the level of outsourcing (Ang and Cummings, 1997; Grover, Cheon and Teng, 1996; Wang, 2002). Expected sources of UC asset

specificity include the specific investments in customized technology and human capital required for the UC transaction. These arguments suggest:

> ***Hypothesis 4:*** *The greater the specificity of the firm's IT infrastructure assets, the lower the likelihood of UC acceptance.*

Technological Uncertainty

Prior research has suggested that some forms of IT outsourcing involve uncertainty and pose greater risks than others (Currie and Willcocks, 1998; Willcocks and Lacity, 1999). Management theorists typically define risk as a condition under which the outcomes of a decision and the probabilities associated with the outcomes are known, whereas uncertainty involves outcomes for which probabilities are not known. Uncertainty in TCT refers to the inability to predict relevant contingencies from unpredictable changes and information asymmetry resulting from strategic nondisclosure or distortion of information by the sellers (Williamson, 1981). All outsourcing transactions involve some degree of uncertainty because it is prohibitively costly or impossible to have the precise information necessary to make an informed decision (Jurison, 1995). TCT states that as uncertainty increases, market transactions are replaced by hieratical authority relationships (Williamson, 1981). Since UC is yet to have well-established technological standards, processes and proven records of success, potential adopters may perceive it to be uncertain technologically and risky as a business decision. As a result we expect:

> ***Hypothesis 5:*** *The greater the amount of perceived technological uncertainty for UC compared to current IT infrastructure alternatives, the lower the likelihood of UC acceptance.*

Business Strategies

IT Core Competency

Focusing on a firm's core competencies has been identified as a motivating factor in the outsourcing decision (King, 1994). Literature has defined a core competency as being an activity that is key, critical, and fundamental for the organization (Hancox and Hackney, 2000). The trend has been for organizations to concentrate on their defined organization's core competencies and outsource non-core competencies. Activities, which are not core competencies, should be considered for outsourcing with 'best-in-world' suppliers, although, some non-core activities may be retained in house if they are part of a defensive posture to protect competitive advantage. The issue is whether the IT infrastructure being replaced through UC is a core competency of the organization, which can be used as a competitive advantage now or in the future by the organization.

Furthermore, the internal IT competence of the firm has been used to explain the amount of outsourcing engaged in by the firm (Loh and Venkatraman, 1992). Literature has shown that the strength of the IT department within the firm has a strong influence on the decision to outsource IT. It is often reported that IS executives who have an influence over corporate strategy frequently decide to insource, even though they could outsource. Reasons given for insourcing are to allow the IT department to preserve their authority over the IT resources, and to maintain power and governance within the organization (Jarvenpaa and Ives, 1991; Nam et al., 1996). Moreover, the TCT frequency construct mentioned earlier, defines frequency as the recurring nature of transactions (Williamson, 1981). In our study, we expect high frequency of IT use to be correlated to a stronger IT function and a relatively higher IT competency within the firm, limiting the reliance on UC. Therefore, we expect:

> ***Hypothesis 6:*** *The higher the strength of IT core competency through the influence of the IT function within the organization, the lower likelihood of UC acceptance.*

Strategy Orientation

The decision to accept UC like all other outsourcing decisions is a strategic one. It has become apparent that firms should align their IT strategy with its business strategy to achieve corporate success (Palmer and Markus, 2000; Sabherwal and Chan, 2001). The strategic orientations of the adopting firms are expected to influence the acceptance of IT outsourcing (McKee, Varadarajan, and Pride, 1989; Palmer and Markus, 2000; Sabherwal and Chan, 2001; Vorhies and Morgan, 2003). The widely used Miles and Snow (1978) business strategy classification will be used to analyze UC acceptance based on the firm's strategy. They classify three common types of strategic behavior into the Prospector-Defender-Analyzer typology. They have found that almost all competitive approaches revolve around these three fundamental business strategies. Of the three strategic orientations, we select the two extremes: prospectors and defenders for the analysis of UC acceptance, since the analyzer type falls somewhere between the two extremes and has had a less clear impact in empirical studies.

Prospectors are "first to market" with a new product or service and differentiate themselves from competitors by using their ability to develop innovative technologies and products. They are the firms who are often the creators of change and uncertainty to which their competitors must respond. Prospectors emphasize innovativeness and invest heavily in product R&D. They typically seek flexibility in their technology in order to react quickly to new market opportunities. Prospectors use more flexible managerial structures such as autonomous work-groups or product divisions in which planning and control are highly decentralized. These structures support market responsiveness, but at the expense of overall specialization and efficiency (Miles and Snow, 1986). Because prospectors continuously search for market opportunities, invest heavily in R&D and seek flexibility in their technology we expect:

Hypothesis 7: *The higher the firm's strategic orientation as a prospector, the higher the likelihood of UC acceptance*

Defenders are classified as organizations that offer limited, stable product lines and compete primarily on the basis of value and/or cost. Defenders stress operational efficiency and economies of scale. They seldom make major adjustments in their technology, structure or methods of operation and rarely search outside of their domain for new opportunities. They typically support the managerial characteristics of centralized decision-making and control, vertical communications and integrations with high degrees of technical specialization (Miles and Snow, 1986). Because defenders typically stress operational efficiencies, economies of scale and cost control, but are reluctant to making major adjustments to their technology we expect:

Hypothesis 8: *The higher the firm's strategic orientation as a defender, the lower the likelihood of UC acceptance*

CONCLUSION

This study brings attention to UC, which can be viewed as the next phase of IT outsourcing. The UC acceptance model was developed, in which the salient antecedents of UC acceptance were identified. The next step for this study is the empirical test of the model through survey research in partnership with UC providers. The potential contribution of this study is in increasing the understanding of the challenges that UC providers and adopters encounter in their attempts to create a more agile and flexible environment for IT infrastructure.

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