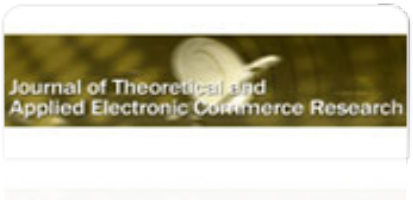

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The Logic of Electronic Hybrids: A Conceptual Analysis of the Influence of Cloud Computing on Electronic Commerce

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Abstract

This paper extends the on-going analysis of the electronic markets hypothesis by offering a complementary hypothesis, namely, the electronic hybrids hypothesis. In a seminal 1987 article, Malone, Yates, and Benjamin predicted an overall shift toward proportionately more use of electronic markets rather than electronic hierarchies. However, critics of this hypothesis have highlighted various factors that are responsible for its limited predictive validity, in particular for electronic business-to-business (B2B) commerce. This paper revisits transaction cost economics and the electronic markets literature to identify five *inhibiting factors* that have led to a much narrower shift than that predicted by the electronic markets hypothesis. The main argument developed in this paper is that the growing use of cloud computing is expected to mitigate those inhibiting factors and consequently lead to a further shift toward electronic markets. However, because the inhibiting factors are mitigated, but not eliminated, cloud computing has the potential to shift electronic B2B commerce toward more open, loosely-coupled exchanges, without electronic markets becoming the dominant mode of governance.

Keywords: Electronic commerce, Cloud computing, Electronic markets, Transaction cost economics, Conceptual analysis

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1 Introduction

In a seminal paper on the impact of information technology (IT) on the organization of economic activity, Malone, Yates, and Benjamin [28] predicted an overall shift toward proportionately more use of electronic markets rather than electronic hierarchies. This *electronic markets hypothesis* was justified by two effects of IT on the nature of economic transactions. The first is a reduction in coordination costs, including transaction costs of searching for trading partners, exchanging information, negotiating contracts, and controlling performance. The second effect is a reduction in asset specificity (the extent to which an asset cannot readily be used by other firms) and in the complexity of product description. As markets are considered disadvantageous in transaction costs and less efficient for asset-specific and highly-complex transactions, the effects induced by IT of reducing these three elements are expected to foster a shift toward more use of markets.

Despite its popularity, critics of the electronic markets hypothesis have argued that it fails to consider the dynamic and relational environment in which IT is being used [11]-[12], [18], [20]. In particular, the hypothesis fails to explain how business-to-business (B2B) relationships evolve over time as a consequence of such elements as switching costs, exchange frequency, and trust [17]. Other critics have highlighted the importance of such elements as transaction economies of scale and learning curve effects that favor a move toward long-term relationships with a smaller set of suppliers [8]. These critiques are consistent with evidence showing that most electronic B2B commerce is conducted via private supply chain platforms that are owned by a single purchasing firm (such as Wal-Mart or Procter & Gamble) on the basis of its enterprise resource planning (ERP) system. These private platforms are responsible for about 75% of all B2B expenditures by large firms, far exceeding the expenditures for all forms of electronic markets [23].

The purpose of this paper is to extend the analysis of the electronic markets hypothesis by offering a complementary hypothesis, the electronic hybrids hypothesis, which explains how electronic commerce will be affected by the recent advent of the cloud computing paradigm. We begin by revisiting the literature on transaction cost economics to identify a general typology of governance structures that extends the simplistic distinction between hierarchies and markets. This broader typology is then employed to describe the past and future trajectories of electronic B2B transactions. In particular, it is argued that distinct characteristics of IT, denoted here as *inhibiting factors*, have led to a much narrower shift than that predicted by the electronic markets hypothesis, namely, a shift from electronic hierarchies to electronic relational hybrids. However, it is argued, recent IT developments, specifically the growing use of cloud computing, are expected to mitigate those inhibiting factors and consequently lead to a further shift toward electronic markets that would be realized in a shift from electronic relational hybrids to electronic recurrent hybrids. Consequently, this paper provides the conceptual foundations for understanding and predicting the transformations in electronic B2B commerce as a result of the emergence of cloud computing.

2 Markets, Hybrids, and Hierarchies

Williamson [37], the most influential scholar in the development of transaction cost economics, focused on the trade-off between two discrete governance structures, markets and hierarchies. Markets are non-specific governance structures within which multiple buyers and sellers meet for short-term exchanges of standardized goods at equilibrium prices. In contrast, hierarchies are highly-specific governance structures that are tailored to the particular needs of the transaction and which generally take two forms: bilateral and unified. Whereas bilateral structures maintain the autonomy of the parties, in unified structures the transaction is removed from the market (vertical integration) and organized within the firm [38]. Most of the conceptual and empirical work motivated by transaction cost economics has aimed at identifying transaction characteristics such as asset specificity, transaction uncertainty, and exchange frequency, for which markets or hierarchies are the efficient (i.e., transaction cost minimizing) governance structure [27].

Although the roots of a third, semi-specific governance structure are found in Williamson's [38] early work, it was only in 1991 that he came to formally define this intermediate governance structure as a hybrid form [39]. Hybrid governance structures are typically multilateral, long-term agreements that may take numerous shapes including inter-firm networks, alliances, and chains [32]. The multilateral nature of hybrids distinguishes them from hierarchies, which have a bilateral or unified structure. Also, hybrids involve long-term relationships and are therefore distinguishable from markets with their underlying mechanisms of supply and demand. Research on hybrid forms suggests that they are best characterized as representing an intermediate degree of inter-firm coupling between the authority relationship characterizing hierarchies and the loose relationship characterizing markets. Accordingly, hybrids are characterized by an intermediate degree of inter-firm control and adaptability in that opportunistic behavior is constrained by contractual safeguards, although the parties are highly independent to adapt to environmental changes. Powell [33] considered network forms of organization as hybrids that represent more social structures of exchange – more dependent on relationships and mutual interests and less guided by formal authority structures. Whereas hierarchies are normatively based on employment relationships and markets are normatively based on contracts, the normative basis of networks is complementary strengths [33].

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However, even this three-type typology of governance structures has been criticized for being excessively parsimonious and for merely representing various forms of cooperative relationships with a single hybrid type. Consequently, Ring and Van de Ven [34] offered a broader typology that includes two hybrid forms of governance, recurrent transactions and relational transactions. Recurrent transactions involve repeated, relatively short-term exchanges between autonomous parties that are characterized by episodic production and transfer of property rights and by relatively certain and complete exchange terms. Conversely, relational transactions involve long-term exchanges between autonomous parties that are characterized by sustained production and transfer of property rights and by relatively uncertain and incomplete exchange terms. Recurrent transactions are therefore more comparable to markets, whereas relational transactions are more comparable to hierarchies. The typology of governance structures resulting from the above discussion is graphically depicted in Figure 1.

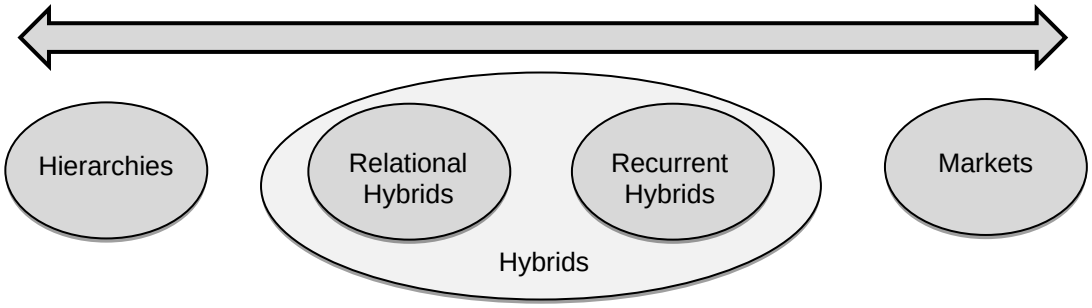

Figure 1: Typology of governance structures

3 From Electronic Hierarchies to Electronic Hybrids

The distribution of computing power derived from the ubiquity of personal computers and client-server architectures during the second half of the 1980s and the early 1990s engendered numerous papers on the impact of IT on the organization of economic activity. As noted earlier, the electronic markets hypothesis predicted a major shift from electronic hierarchies to electronic markets. Clearly, electronic hierarchies were the only viable option in an age of centralized computing and limited connectivity where electronic exchanges could be implemented either by internal organization or by the strong electronic coupling of two firms. However, as computing power had become cheaper and distributed, it was reasonable to argue that the reduction in coordination costs, asset specificity, and product description complexity would lead to more use of electronic markets [28].

The electronic markets hypothesis has proved over the years to be a valid depiction of electronic commerce trends, especially for business-to-consumer (B2C) transactions. However, several studies have highlighted the analytical shortcomings of this hypothesis. A review of this literature suggests that the hypothesis underestimates the importance of transactional economies of scale, learning curve effects, supplier incentives, information transparency, and relational attributes, all of which inhibit the shift to electronic markets and favor a less dramatic shift from electronic hierarchies to long-term relationships with a smaller set of suppliers. Transactional economies of scale are the consequence of fixed costs associated with IT licensing, customization, and deployment. Given these fixed costs, the average cost of a transaction decreases with the volume of transactions, motivating the parties to increase transaction volume [8]. Learning curves have a similar effect, motivating firms that have already paid the learning cost associated with IT deployment to benefit from the learning curve by favoring long-term relationships. Supplier incentives offer a complementary explanation [5]. These incentives relate to noncontractible, relationship-specific investments made by suppliers in innovation, technology adoption, quality, trust, and responsiveness. Suppliers are motivated to make such risky investments in their relationships with customers when they are in a position to reap a share of the benefits created by these investments. Opting for a smaller number of suppliers increases their bargaining power and allows them to benefit from a greater share of the value created by their investments. Information transparency addresses the limitations of electronic markets through the lens of information economics [41]. The transparency of information characterizing electronic markets leads to pricing pressure and margin erosion, which incentivize firms not to trade through electronic markets. This difficulty implies that membership-restricted exchanges may have informational advantages over open public exchanges. Finally, the electronic markets hypothesis underestimates the importance of such relational attributes as trust and goal congruence in reducing transaction risks [17]. Given the advancement of management approaches and operational practices, the efficiency of contemporary exchanges is contingent on many aspects other than price, such as quality, reliability, customizability, and responsiveness. Such noncontractible, performance-related aspects increase the operations risk and opportunism risk of market-based transactions and imply that a superior trading strategy would be to establish long-term relationships with a smaller set of trusted suppliers.

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Using the typology of governance structures depicted in Figure 1, the shift from electronic hierarchies to long-term relationships with a small number of suppliers, labeled as the "move to the middle" [8], can be described as a shift from electronic hierarchies to electronic hybrids. More specifically, long-term relationships with a small set of suppliers are analogous to the governance structure of relational hybrids because both involve sustained, long-term exchanges between autonomous parties. Therefore, the *move to the middle* hypothesis essentially describes a shift from electronic hierarchies to electronic relational hybrids.

This transition to electronic relational hybrids is the consequence of the five inhibiting factors outlined above: transactional economies of scale, learning curve effects, supplier incentives, information transparency, and relational attributes. These factors are presumably responsible for the limited effect of IT on electronic exchanges, culminating in electronic relational hybrids instead of electronic markets. However, as argued in the following section, the recent emergence of cloud computing mitigates these inhibiting factors and thus provides a new path that is expected to bring electronic commerce closer to electronic markets.

4 The Benefits of Cloud Computing

The most dramatic development in the organizational use of IT in the past five years is cloud computing [26], which is becoming a new platform for enterprise and personal computing [10]. Cloud computing refers to the use of computing as a utility [3], [6] and it is generally defined as on-demand access to a shared pool of virtualized IT resources [40]. The National Institute of Standards and Technology (NIST) defines cloud computing as "a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction" [31] p. 2. From a technical standpoint, cloud computing entails a mode of delivery in which services are provided from distant data centers over the Internet [1]. From an economic standpoint, cloud computing entails a model of pricing in which services are made available in a pay-as-you-go manner, similar to the utility pricing model [6].

The cloud model is composed of five essential characteristics, three service models, and four deployment models [4], [31]. The essential characteristics are on-demand self-service, broad network access from heterogeneous client platforms, resource pooling to serve multiple consumers using a multi-tenant model, rapid elasticity to adapt to consumer demand, and service measurement based on a metering capability. The cloud model provides infrastructure, platform, and software services: Infrastructure as a Service (IaaS) refers to the consumption of processing, storage, networks, and other fundamental computing resources; Platform as a Service (PaaS) refers to the deployment of the consumer's applications onto the cloud infrastructure; Software as a Service (SaaS) refers to the use of the provider's applications running on a cloud infrastructure. Finally, four deployment models are available for cloud computing: exclusive use by a single organization (private cloud), exclusive use by a specific community of consumers from organizations that have shared concerns (community cloud), open use by the general public (public cloud), or a composition of two or more of these deployment models (hybrid cloud).

Based on the existing literature on cloud computing, we argue that the technical and economic features of cloud computing deliver the following benefits: reduced fixed costs, increased standardization, reduced switching costs, improved adaptability, introduction of intermediaries, and variation in openness. In the following we describe how these benefits have the potential to mitigate the inhibiting factors of electronic markets discussed above.

4.1 Reduced Fixed Costs

In the traditional on-premise model, the deployment of new systems typically requires considerable investments in hardware acquisition and installation, software licensing and customization, and business process redesign. Moreover, the continuous use of these systems demands additional investments in system maintenance, upgrade, and migration. A major benefit of the cloud computing model is that it converts capital expenses to operating expenses [3], [29] as it requires no on-premise system deployment and has an on-demand pricing scheme. In essence, computing resources are readily available with minimal set-up costs [4]. Fixed costs, however, are not completely eliminated in cloud computing because of business process redesign and service-level management costs [13]. While cloud computing eliminates the fixed costs of new hardware and software, it does not eliminate the fixed costs of modifying business processes to make the most of the new system and the fixed costs of such services as ongoing administration, assurance of service level agreements (SLA), security hardening, and performance tuning [13].

The reduction in fixed costs mitigates the inhibiting factor of transactional economies of scale. As discussed earlier, the fixed costs of IT deployment are responsible for transactional economies of scale (the average cost of a transaction decreases with the volume of transactions), which in turn create incentives for the exchange partners to increase transaction volume. Absent the fixed costs, the exchange partners have less motivation to trade in high volume.

Kauffman and Tsai [22] describe unified procurement, which occurs when a firm elects to purchase all compatible products and services from a single vendor, as a strong manifestation of the *move to the middle* hypothesis. Unified

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procurement seems to be a dominant strategy in the enterprise software industry, as firms are increasing outsourcing while dramatically decreasing the number of vendors, despite the opportunism risks associated with vendor exclusivity [22]. Although this strategy is driven by the desire of firms to transfer the cost of IT integration to their vendors, it also allows them to benefit from transactional economies of scale for each specific exchange. The use of cloud computing reduces the fixed costs of enterprise software deployment, including those of IT integration. This benefit of cloud computing may lead firms to prefer the multivendor procurement strategy over the unified procurement strategy.

4.2 Increased Standardization

Cloud computing is founded on a centralized delivery model, according to which little processing takes place on the client side [24]. Standardization is therefore essential for the ability of cloud providers to efficiently deliver application services from a central facility at competitive prices. Put differently, the economic viability of cloud computing depends on the efficient management of large data centers, and this efficiency cannot be achieved without a high level of hardware and software standardization. From an organizational standpoint, standardization is the consequence of the reduced software customization that characterizes the deployment of enterprise systems via cloud computing. The cloud route to the deployment of enterprise systems typically provides less degrees of freedom in customizing the software (i.e., increased standardization) than the traditional licensing route. From the standpoint of end-users, the use of cloud computing generally means that the Web browser serves as the user interface for application services, providing a comparatively standardized look-and-feel to cloud applications. While cloud programming interfaces and technical standards are usually simple and standardized, some interfaces and services are specific to individual cloud platforms, such as the mapping services of Google and the payment services of Amazon [10]. Lack of standardization therefore remains an issue in cloud computing [25], [29].

Increased standardization mitigates the inhibiting factor of learning curve effects. As discussed before, firms that have already paid the learning cost associated with IT deployment are motivated to favor long-term exchange relationships. However, when standardization increases, new systems require lower learning costs and the learning curve becomes flatter. Therefore, the standardization facilitated by cloud computing diminishes the motivation to favor long-term relationships.

According to transaction cost economics, asset specificity has a strong influence on transaction costs and, consequently, on the efficiency of different governance structures [27]. The asset specificity-reducing effect of IT has already been considered in the electronic markets hypothesis as an important driver of the shift from electronic hierarchies to electronic markets [28]. However, with the higher standardization and lower asset specificity enabled by cloud computing, the efficiency of electronic markets is expected to increase further.

4.3 Reduced Switching Costs

When the costs of switching from one exchange partner to another are high, the firm becomes *locked in* the relationship and can be vulnerable to being *held up* by its partner. Switching costs are largely the outcome of investments in relationship-specific assets, which cannot readily be used in relationships with other partners. Whereas traditional B2B technologies involved significant relationship-specific investments in system licensing, customization, and deployment, the scale of relationship-specific investments associated with the use of cloud computing is much smaller [21]. First, cloud computing requires little upfront investment given its on-demand pricing scheme. Second, even when upfront investments are necessary, they need not be relationship-specific given the standardization that characterizes cloud computing. Therefore, switching costs are lower in cloud computing as a consequence of the two aforementioned benefits of reduced fixed costs and increased standardization. Switching costs, however, are not completely eliminated in cloud computing because of the use of proprietary storage programming interfaces, which make it difficult to migrate from one site to another [3], [24]. Cloud offerings therefore involve a certain degree of lock-in [6], [13].

The reduction in switching costs primarily mitigates the inhibiting factor of relational attributes. When using electronic markets, firms are highly exposed to operations and opportunism risks, which are largely limited by such relational attributes as trust and goal congruence. In a sense, relational attributes serve as a mechanism for reducing transaction risks. The reduction in switching costs provides an alternative mechanism for safeguarding against transaction risks, thereby reducing the benefit of relational attributes and allowing firms to rely more heavily on market-based transactions.

Bunduchi [7] describes the case of a large service provider in the petroleum industry that uses an Internet-based electronic platform to collaborate with its business customers. The collaborative applications of this provider are highly customized to the requirements of its larger customers, increasing their switching costs and improving the provider's bargaining position. These collaborative relationships are also characterized by a high level of organizational trust between the provider and its customers. The analysis by Bunduchi [7] suggests that high organizational trust is likely to be associated with high switching costs. This reasoning implies that with the reduction in switching costs, trust may be less important as a mechanism to safeguard against transaction risks.

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4.4 Improved Adaptability

Another major benefit of cloud computing is its adaptability in situations of uncertain or varied demand for computing resources [3], [21]. When demand is unknown in advance (e.g., startups, innovative systems) or when demand varies with time, the practically infinite scalability of cloud computing provides the ability to scale-up or scale-down the use of computing resources with little penalty in time or cost. The efficiency of the on-demand model is superior to that of conventional models, in particular when the use of computing resources is unpredictable or varied. However, despite the promise of infinite capacity on demand, in many cases the cloud platform is unable to scale up and down quickly without violating SLA because of technical issues such as input/output channel limitations [3], [24].

Improved adaptability reduces the inhibiting factor of supplier incentives. Because suppliers are incentivized to make noncontractible investments when their bargaining power allows them to share the value created by these investments, customers are incentivized to establish long-term relationships with a small number of suppliers. Noncontractible investments are often targeted at improving the supplier's ability to adapt to the customer's changing needs and requirements beyond those that are explicitly stated in the contract. Against this background, the improved adaptability inherent to cloud computing mitigates the need for such noncontractible investments in adaptability, although the need for other noncontractible investments (e.g., in quality or innovation) remains.

As a consequence of the improved adaptability to ex post changes in the demand for computing resources, cloud computing reduces the transaction costs associated with negotiation and enforcement, which generally limit the efficiency of electronic markets. Negotiation costs involve the costs of negotiating the exchange terms and of formally drafting contracts, and enforcement costs involve the costs of ensuring that contractual agreements are enforced [9]. The adaptability of the underlying technological platform can substitute for the adaptability embedded in the contract through contingency clauses. In other words, if the technological platform allows more flexibility, then the contract can be less complete, implying lower costs of contract negotiation and enforcement. Consider, for example, a scenario where a client has outsourced an online procurement system to an external service provider [35]. At the beginning of the relationship, the client and the provider agree on an overview of the service to be delivered. The complete details are ironed out only ex post because the hosted software may need to be integrated with other enterprise systems and because the growth of business may necessitate changes in the service scope. When these changes are more easily implemented, the costs of negotiating the contract are reduced and there is less need for renegotiation ex post. Furthermore, as adaptability improves, it becomes less important for clients to sacrifice their bargaining power to ensure that suppliers are incentivized to invest in being responsive to customer demands.

4.5 Introduction of Intermediaries

The delivery model of cloud computing often involves a third party, the cloud provider, who is not involved in traditional exchanges between buyers and sellers. The IT provider is seldom a party to the relationship in traditional exchanges where its primary role is to deploy the systems that enable the exchange. Once those systems become operational, the role of the IT provider becomes passive. Conversely, the IT provider runs the platform upon which transactions are performed in cloud-based exchanges. Cloud providers are therefore similar to electronic market providers in the sense that both can mediate B2B relationships, although mediation is hardly the main objective of cloud providers.

The introduction of intermediaries, similar to improved adaptability, reduces the inhibiting factor of supplier incentives because it weakens the coupling of suppliers and customers [2]. Suppliers are less incentivized to make noncontractible investments when their relationships with customers are mediated by platform providers, thereby reducing the significance of this factor when cloud computing is used. The reliance on platform providers, however, introduces concerns about security [4], [40] and control over data and processes [24], [29].

Intermediaries have traditionally been considered a necessary transaction cost that is incurred to reduce the cost of searching for information about available options [9]. The decoupling of suppliers and customers, facilitated by cloud computing, reduces transaction risks without incurring in additional search costs. In this sense, the introduction of cloud computing intermediaries ultimately leads to lower transaction costs of market exchanges.

4.6 Variation in Openness

Cloud computing employs various deployment models with various degrees of openness [31]. With a public cloud, the infrastructure is available to the general public or large industry groups and is owned by a cloud provider. In contrast, a private cloud infrastructure is operated solely for an organization, either on- or off-premise. Furthermore, a cloud can be designed to serve a specific community and to be shared by several organizations [21].

This variation in openness mitigates the inhibiting factor of information transparency because of its potential to enhance the fit between the preferred level of information transparency and the transparency level characterizing the

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exchange platform. The various openness alternatives provided by cloud computing are able to accommodate various transparency needs.

Granados, Gupta, and Kauffman [18] present a unified theoretical framework about the role that IT plays, together with competitive and institutional forces, in affecting the dominance of transparent electronic markets. Their analysis shows that there is significant variation in the degree of market transparency across different industry sectors. Their analysis of the air travel industry, for instance, finds significant differences in market transparency between two B2B sectors of this industry. While transparent markets are dominant in travel agency distribution because of regulatory measures that curbed anti-competitive behavior, opaque and biased markets are dominant in the corporate travel sector because the non-digital nature of customer service increases the competitive value of differentiation strategies [18]. This analysis shows that different degrees of market transparency are strategically preferable in different industry sectors. Therefore, the various deployment models of cloud computing provide the basis for meeting various transparency needs, advancing the use of electronic exchange platforms.

The inhibiting factors, their effects, and the manner in which they are mitigated by cloud computing are summarized in Table 1.

Table 1: Inhibiting factors and the influence of cloud computing

Inhibiting Factor	Inhibiting Effect	Influence of Cloud Computing
Transactional economies of scale	Fixed costs associated with IT licensing, customization, and deployment motivate the parties to increase transaction volume	**Reduced fixed costs** – capital expenses are converted to operating expenses, so the parties have less motivation to trade in high volume
Learning curve effects	Firms that have already paid the learning cost associated with IT deployment are motivated to favor long-term relationships	**Increased standardization** – new systems require lower learning costs and the learning curve becomes flatter
Supplier incentives	Suppliers make noncontractible, relationship-specific investments when their bargaining power allows them to share the surplus	**Improved adaptability** – suppliers are not required to make noncontractible investments in adaptability; **Introduction of intermediaries** – the coupling of suppliers and customers is weakened, reducing the significance of noncontractible investments
Information transparency	Information transparency leads to pricing pressure and margin erosion	**Variation in openness** – various transparency needs can be accommodated
Relational attributes	Relational attributes serve as a mechanism for reducing transaction risks	**Reduced switching costs** – the reduction in lock-in provides an alternative mechanism for safeguarding against transaction risks

5 The Electronic Hybrids Hypothesis

The six benefits of cloud computing discussed in the previous section – reduced fixed costs, increased standardization, reduced switching costs, improved adaptability, introduction of intermediaries, and variation in openness – mitigate the five inhibiting factors of electronic markets. It is important to note, however, that the inhibiting factors are mitigated, not eliminated. Transactional economies of scale remain a motivating factor because cloud computing eliminates the fixed costs of new hardware and software, but not the fixed costs of business process redesign and service-level management. Learning curve effects are still at play because cloud services, despite their increased standardization, involve a certain level of variability and require some learning. Supplier incentives to make noncontractible investments in adaptability indeed become less important, but their incentives to make other noncontractible investments (e.g., in quality or innovation) still matter. Information transparency is addressed by the variation in openness, although pricing pressure remains a concern in more open exchanges. Finally, relational attributes should still be considered in any exchange between firms, given the importance of such relational attributes as trust and goal congruence. Because the inhibiting factors are reduced, but not eliminated, cloud computing has the potential to shift B2B commerce toward more open, loosely-coupled exchanges, without electronic markets becoming the dominant mode of governance. In other words, cloud computing can move B2B commerce further toward, but not to, electronic markets.

This logic underlies the electronic hybrids hypothesis, according to which the increasing use of cloud computing will lead to an overall shift toward proportionately more use of recurrent hybrids, rather than relational hybrids, to coordinate electronic B2B commerce. The analysis in this paper shows that five inhibiting factors account for the superiority of the *move to the middle* hypothesis over the electronic markets hypothesis in predicting the trajectory of B2B commerce. Whereas the electronic markets hypothesis predicts a revolutionary trajectory from electronic

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hierarchies to electronic markets, the *move to the middle* hypothesis predicts an evolutionary trajectory from electronic hierarchies to electronic relational hybrids (i.e., long-term relationships with a smaller set of suppliers). Evidence has shown that electronic markets are struggling to survive, while electronic relational hybrids are prevalent in B2B commerce [14], [17], [19], [23].

We extend this logic and argue that the increasing use of cloud computing will put B2B commerce back on the path toward electronic markets. This prediction is based on the potential of benefits attributed to cloud computing to mitigate the inhibiting factors of electronic markets. However, because the inhibiting factors are reduced, not eliminated, the new trajectory will lead to electronic recurrent hybrids, rather than to electronic markets (see Figure 2 for a graphical representation of the various hypotheses). The main implication of inhibiting factors being mitigated is that firms are able to better balance the advantages of long-terms relationships with the advantages of market mechanisms. Experiencing lower levels of lock-in and opportunism risk, firms are set to benefit from the forces of supply and demand. Firms should therefore favor governance structures that represent an equilibrium between long-term relationships and arm's-length relationships.

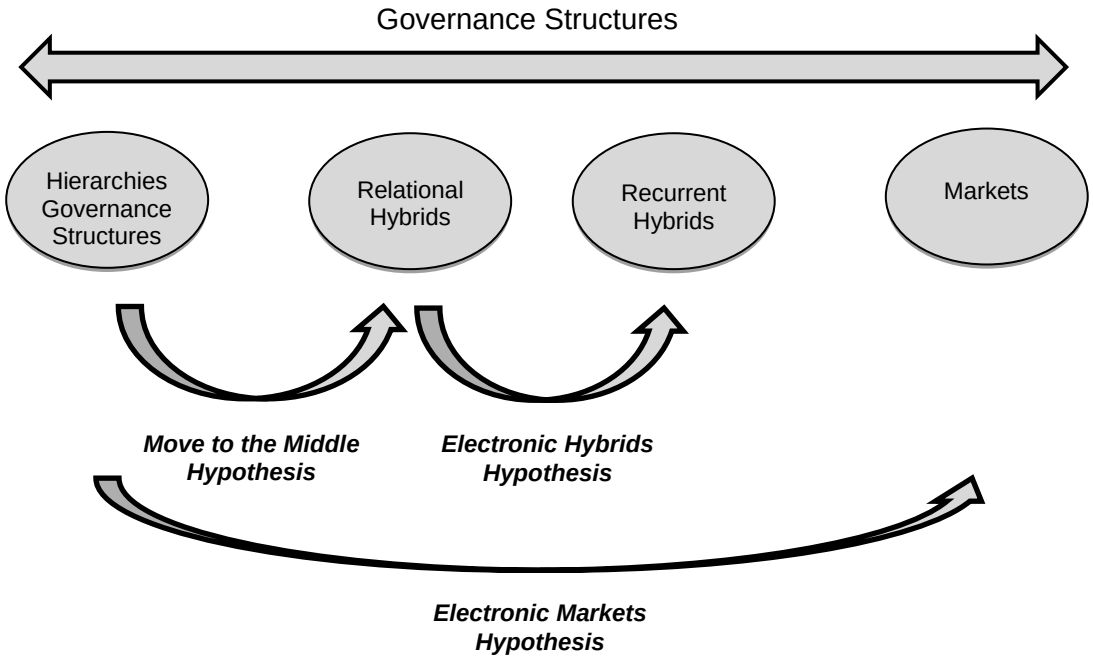

Figure 2: A graphical representation of the various hypotheses

It is important at this point to more explicitly describe the characteristics of the four electronic governance structures of hierarchies, relational hybrids, recurrent hybrids, and markets. Electronic hierarchies and electronic markets represent the archetypical governance structures in transaction cost economics. Whereas electronic hierarchies involve hierarchical, indefinite, closed relationships in which authority structures define the configuration and terms of exchange, electronic markets involve arm's-length, instantaneous relationships in which the terms of exchange are complete and firm. Electronic hybrids are found between these two extremes and involve some degree of coupling among independent organizations. Electronic relational hybrids represent the more tightly-coupled structure – the number of parties is small, the exchange is long-term, its configuration is mostly bilateral with open and incomplete terms, and competition is low [34]. In contrast, electronic recurrent hybrids represent the more loosely-coupled structure – the number of parties is large, the exchange is relatively short-term, its configuration is multilateral with complete and adjustable terms, and completion is moderate [34]. Evidence of recurrent hybrids can be found in different areas of research. In discussing the bazaar economy, Geertz [16] identifies the tendency for repetitive purchasers of particular goods and services to establish continuing relationships with particular suppliers. In discussing network forms of organization, Powell [33] describes the film and recording industries as thriving on recurrent, short-term contracting, minimization of fixed overhead, mutual monitoring of buyers and sellers, and a constant weaving and interweaving of relationships. Mayer and Argyres [30] analyze the phenomenon of repeated contracting in markets for IT services. Such repeated contracting has been shown to result in less complete contracts due to the reduced risk of vendor opportunism [15]. Table 2, which presents the characteristics of the four electronic governance structures, demonstrates why electronic recurrent hybrids represent an equilibrium between long-term and arm's-length relationships.

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Table 2: Characteristics of the four electronic governance structures

Characteristic	Electronic Hierarchies	Electronic Relational Hybrids	Electronic Recurrent Hybrids	Electronic Markets
Nature of relationship	Hierarchical	Tightly coupled	Loosely coupled	Arm's-length
Duration of exchange	Indefinite	Long term	Short to moderate term	Instantaneous
Terms of exchange	Authority structure	Open and incomplete	Complete and adjustable	Complete and firm
Number of parties	One	Small	Large	Unlimited
Configuration of exchange	Internal	Bilateral	Network	Market
Degree of competition	None	Limited	Moderate, contingent on prior performance	High
Degree of openness	Closed	Highly restricted	Moderately restricted	Open
Nature of system	Internal system	System-to-system integration	External services, restricted access	External services, open access

The electronic hybrids hypothesis suggests that recurrent hybrids will gradually replace relational hybrids as the dominant governance structure in electronic B2B commerce. The implication of this prediction is that business networks will become larger, less restrictive, and more competitive. They will become more similar to communities or ecosystems than to long-term partnerships, but still distinguishable from open and competitive markets. The electronic hybrids hypothesis further suggests that this transition will be facilitated by cloud computing as a consequence of its effects on two opposing forces. The first force, pushing toward electronic markets, is based on the logic that IT changes transaction characteristics, resulting in lower transaction costs and more use of electronic markets [9], [28], [36]. Cloud computing has the potential to reduce transaction uncertainty (due to improved adaptability), asset specificity (due to increased standardization), and the frequency of exchange with specific vendors (due to reduced fixed costs and switching costs), all of which should lead according to transaction cost economics to lower transaction costs and to markets becoming a more efficient alternative. The second force, pushing away from electronic markets, is based on the logic that various inhibiting factors imply higher operations and opportunism risks and, consequently, higher transaction costs and preference for more sustained relationships [8], [22]. As discussed previously in this paper, cloud computing has the potential to mitigate the influence of these inhibiting factors. Therefore, cloud computing increases the economic viability of electronic markets while maintaining some operations and opportunism risks. Given these transaction characteristics, electronic recurrent hybrids appear to be the most efficient governance structure because the reliance on business familiarity and recurrent transactions can address the remaining operations and opportunism risks. Cloud computing has the appropriate characteristics to support electronic commerce in relatively large networks of independent buyers and sellers who are accustomed to transact with one another based on their past experience and business familiarity. Unlike the system-to-system integration characterizing electronic relational hybrids and the open-access Internet platforms being used in electronic markets, electronic recurrent hybrids should be supported by restricted-access, community-oriented platforms. A good example is community clouds, which can support the transparent flow of information along entire supply chains and the coordination among raw material suppliers, component suppliers, manufacturers, and business customers. Such clouds offer the flexibility to enter the supply chain with relatively low fixed costs and to exit the supply chain with relatively low switching costs, bearing low operations and opportunism risks.

6 Implications and Conclusions

Cloud computing increasingly attracts the attention of both academics and practitioners, and many discussions in recent years have revolved around its technical, organizational, and economic merits. An issue that has been somewhat neglected in these discussions, however, is the impact of cloud computing on economic organization and governance choice. This neglect is particularly notable in the context of the ongoing discussions on the predictive validity of the electronic markets hypothesis. In a sense, this paper suggests that both the electronic markets hypothesis and the *move to the middle* hypothesis are valid, but only if different technological eras are used to test the two hypotheses. The *move to the middle* hypothesis accurately predicted the trajectory of B2B commerce with the advent of the Internet. The electronic markets hypothesis, however, should be tested over a longer period of IT evolution in order to prove itself valid. The dynamics described here suggest that B2B commerce is gradually shifting toward electronic markets and that this shift requires more dramatic developments in IT than originally predicted. In this sense, cloud computing has the potential to finally deliver on the promise of the Internet to the organization of B2B activity. A question that remains to be addressed, nevertheless, is whether the final target of dominant electronic markets can be reached solely on the basis of developments in IT. Our view, consistent with the literature

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[18], is that additional changes in organizational and economic factors are also needed before electronic markets become the prevailing governance structure.

In the meantime, practitioners are poised to reap the benefits of cloud computing for B2B commerce. Cloud computing has the potential to put firms in a superior competitive position by reducing their lock-in to both their suppliers and their IT providers. Firms can thus enter less rigid relationships and benefit more from exposure to the forces of supply and demand. However, for this potential to be realized, IT providers have to develop systems that are more suitable for conducting B2B transactions via cloud-based, on-demand infrastructures. These systems should take the form of multilateral, web-based, supply chain platforms, with special attention given to security issues. The current approach in supply chain management (SCM) is largely based on the traditional on-premise model of enterprise systems, indicating the need for IT providers to invest in adapting SCM systems to the era of cloud computing. Once SCM systems migrate to the cloud, they can be used to facilitate more flexible forms of B2B commerce.

References

[1] R. Alt, W. Abramowicz, and H. Demirkan, Service-orientation in electronic markets, Electronic Markets, vol. 20, no. 3-4, pp. 177-180, 2010.
[2] R. Alt and S. Klein, Twenty years of electronic markets research—looking backwards towards the future, Electronic Markets, vol. 21, no. 1, pp. 41-51, 2011.
[3] M. Armbrust, A. Fox, R. Griffith, A. D. Joseph, R. Katz, A. Konwinski, G. Lee, D. Patterson, A. Rabkin, I. Stoica, and M. Zaharia, A view of cloud computing, Communications of the ACM, vol. 53, no. 4, pp. 50-58, 2010.
[4] L. Badger, T. Grance, R. Patt-Corner, and J. Voas. (2012, May) Cloud computing synopsis and recommendations. National Institute of Standards and Technology, Gaithersburg, MD, Special Publication 800-146. [Online]. Available: http://www.nist.gov/customcf/get_pdf.cfm?pub_id=911075.
[5] J. Y. Bakos and E. Brynjolfsson, From vendors to partners: Information technology and incomplete contracts in buyer-supplier relationships, Journal of Organizational Computing, vol. 3, no. 3, pp. 301-328, 1993.
[6] E. Brynjolfsson, P. Hofmann, and J. Jordan, Cloud computing and electricity: Beyond the utility model, Communications of the ACM, vol. 53, no. 5, pp. 32-34, 2010.
[7] R. Bunduchi, Business relationships in Internet-based electronic markets: The role of goodwill trust and transaction costs, Information Systems Journal, vol. 15, no. 4, pp. 321-341, 2005.
[8] E. K. Clemons, S. P. Reddi, and M. C. Row, The impact of information technology on the organization of economic activity: The “move to the middle” hypothesis, Journal of Management Information Systems, vol. 10, no. 2, pp. 9-35, 1993.
[9] A. Cordella, Transaction costs and information systems: Does it add up?, Journal of Information Technology, vol. 21, no. 3, pp. 195-202, 2006.
[10] M. Cusumano, Cloud computing and SaaS as new computing platforms, Communications of the ACM, vol. 53, no. 4, pp. 27-29, 2010.
[11] Q. Dai and R. J. Kauffman, Business models for internet-based B2B electronic markets, International Journal of Electronic Commerce, vol. 6, no. 4, pp. 41-72, 2002.
[12] E. Daniel and G. M. Klimis, The impact of electronic commerce on market structure: An evaluation of the electronic market hypothesis, European Management Journal, vol. 17, no. 3, pp. 318-325, 1999.
[13] D. Durkee, Why cloud computing will never be free, Communications of the ACM, vol. 53, no. 5, pp. 62-69, 2010.
[14] A. F. Farhoomand, V. K. Tuunainen, and L. W. Yee, Barriers to global electronic commerce: A cross-country study of Hong Kong and Finland, Journal of Organizational Computing and Electronic Commerce, vol. 10, no. 1, pp. 23-48, 2000.
[15] L. Fink, Y. Lichtenstein, and S. Wyss, Ex post adaptations and hybrid contracts in software development services, Applied Economics, vol. 45, no. 32, pp. 4497-4508, 2013.
[16] C. Geertz, The bazaar economy: Information and search in peasant marketing, American Economic Review, vol. 68, no. 2, pp. 28-32, 1978.
[17] B. C. Glassberg and J. W. Merhout, Electronic markets hypothesis redux: Where are we now?, Communications of the ACM, vol. 50, no. 2, pp. 51-55, 2007.
[18] N. F. Granados, A. Gupta, and R. J. Kauffman, The impact of IT on market information and transparency: A unified theoretical framework, Journal of the Association for Information Systems, vol. 7, no. 3, pp. 148-178, 2006.
[19] M. Grieger, Electronic marketplaces: A literature review and a call for supply chain management research, European Journal of Operational Research, vol. 144, no. 2, pp. 280-294, 2003.
[20] C. M. Hess and C. F. Kemerer, Computerized loan origination systems: An industry case study of the electronic markets hypothesis, MIS Quarterly, vol. 18, no. 3, pp. 251-275, 1994.
[21] B. Iyer and J. C. Henderson, Preparing for the future: Understanding the seven capabilities of cloud computing, MIS Quarterly Executive, vol. 9, no. 2, pp. 117-131, 2010.
[22] R. J. Kauffman and J. Y. Tsai, The unified procurement strategy for enterprise software: A test of the “move to the middle” hypothesis, Journal of Management Information Systems, vol. 26, no. 2, pp. 177-204, 2009.
[23] K. C. Laudon and C. G. Traver, E-Commerce 2011 (7th Edition). Upper Saddle River, NJ: Prentice Hall, 2011.
[24] N. Leavitt, Is cloud computing really ready for prime time?, Computer, vol. 42, no. 1, pp. 15-20, 2009.

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www.jtaer.com
DOI: 10.4067/S0718-18762013000300002

[25] P. Louridas, Up in the air: Moving your applications to the cloud, IEEE Software, vol. 27, no. 4, pp. 6-11, 2010.
[26] J. Luftman and B. Derksen, Key issues for IT executives 2012: Doing more with less, MIS Quarterly Executive, vol. 11, no. 4, pp. 207-218, 2012.
[27] J. T. Macher and B. D. Richman, Transaction cost economics: An assessment of empirical research in the social sciences, Business and Politics, vol. 10, no. 1, pp. 1-63, 2008.
[28] T. W. Malone, J. Yates, and R. I. Benjamin, Electronic markets and electronic hierarchies, Communications of the ACM, vol. 30, no. 6, pp. 484-497, 1987.
[29] S. Marston, Z. Li, S. Bandyopadhyay, J. Zhang, and A. Ghalsasi, Cloud computing — The business perspective, Decision Support Systems, vol. 51, no. 1, pp. 176-189, 2011.
[30] K. J. Mayer and N. S. Argyres, Learning to contract: Evidence from the personal computer industry, Organization Science, vol. 15, no. 4, pp. 394-410, 2004.
[31] P. Mell and T. Grance. (2011, September) The NIST definition of cloud computing. National Institute of Standards and Technology, Gaithersburg, MD, Special Publication 800-145. [Online]. Available: http://www.nist.gov/customcf/get_pdf.cfm?pub_id=909616.
[32] C. Menard, The economics of hybrid organizations, Journal of Institutional and Theoretical Economics, vol. 160, no. 3, pp. 345-376, 2004.
[33] W. W. Powell, Neither market nor hierarchy: Network forms of organization, in Research in Organizational Behavior (B. M. Staw and L. L. Cummings, Eds.). Greenwich, CT: JAI Press, 1990, pp. 295-336.
[34] P. S. Ring and A. H. Van de Ven, Structuring cooperative relationships between organizations, Strategic Management Journal, vol. 13, no. 7, pp. 483-498, 1992.
[35] A. Susarla, A. Barua, and A. B. Whinston, A transaction cost perspective of the *software as a service* business model, Journal of Management Information Systems, vol. 26, no. 2, pp. 205-240, 2009.
[36] R. T. Wigand, Electronic commerce: Definition, theory, and context, The Information Society, vol. 13, no. 1, pp. 1-16, 1997.
[37] O. E. Williamson, Markets and Hierarchies: Analysis and Antitrust Implications. New York: Free Press, 1975.
[38] O. E. Williamson, Transaction-cost economics: The governance of contractual relations, Journal of Law and Economics, vol. 22, no. 2, pp. 233-261, 1979.
[39] O. E. Williamson, Comparative economic organization: The analysis of discrete structural alternatives, Administrative Science Quarterly, vol. 36, no. 2, pp. 269-296, 1991.
[40] H. Yang and M. Tate, A descriptive literature review and classification of cloud computing research, Communications of the Association for Information Systems, vol. 31, no. 2, pp. 35-60, 2012.
[41] K. Zhu, Information transparency in electronic marketplaces: Why data transparency may hinder the adoption of B2B exchanges, Electronic Markets, vol. 12, no. 2, pp. 92-99, 2002.