

Business Strategy, Cloud Computing, and Supply Chain Management: A Synthesis of Resource-Based View and Social Capital Theory

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ABSTRACT

Despite having various benefits associated with greater information flow in the supply chain, cloud computing technology has limited research in operations or supply chain management literature. Using case study methodology we conduct interviews with six individuals from four different companies in the United States. Our analysis found business strategy impacts the way companies use cloud computing technology. Additionally, this study is the first to provide evidence that cloud computing technology is positively associated with information sharing in the supply chain, which ultimately impacts supply chain performance. Trust is also shown to moderate the relationship between cloud computing usage and information sharing among supply chain partners.

Keywords: Cloud Computing, Information Sharing, Supply Chain Performance, Business Strategy

INTRODUCTION

The ever increasing geographical dispersion in supply chain networks adds to their complexity (Stock et al., 2000). To help effectively manage supply chain complexity, many firms have chosen a strategy of enhanced information technology for the purpose of increasing information flow and in turn enhancing their competitive advantage (Ketchen, Jr. & Hult, 2007). Beyond increasing information flow, there is also a need for supply chain partners to be willing to share information. Research has shown that integrating supply chain practice with efficient information sharing becomes crucial for improving supply chain performance (Zhou & Benton, Jr., 2007).

As new information technologies emerge there is a need to explore their potential in improving supply chain performance. One relatively new technology in supply chain literature is cloud computing. *Cloud computing* can be generally defined as a massively scalable computing power that offers software, infrastructure and platforms on demand using a pay-as-you-go basis through the internet (Foster et al., 2008; Rochwerger et al., 2009). Although new in supply chain literature, it has been shown to have various benefits to information flow, including cost reduction, massively scalable service and on demand access (Rochwerger et al., 2009). Very little empirical research

however has been undertaken to examine its impact on information sharing in a supply chain context or strategy impact on cloud computing use.

We attempt to address this gap by first using resource-based view (RBV) as well as social capital theory to examine the relationships among business strategy, cloud computing usage, information sharing, trust and supply chain performance. We then use multiple case studies to analyze qualitative data received from four different companies. Our findings indicate relationships between each of the constructs that support a proposed theoretical framework. This framework addresses questions including:

1. How does business strategy impact cloud computing technology?
2. How does cloud computing impact information sharing?
3. How does trust moderate the relationship between cloud computing and information sharing?
4. How does information sharing impact supply chain performance?

This study finds four relationships including: first, that the goals of an organization directly impact how cloud computing technology is used. Second, cloud computing usage is positively associated with information sharing. Third, trust moderates the relationship between cloud computing usage and information sharing. Fourth, information sharing is positively associated with supply chain performance.

This study provides a foundation for not only researchers, but also is generalizable to wider business contexts. Cloud computing usage can greatly impact how information sharing is used and is of great importance to overall strategies and plans. This paper provides a practical foundation for both researchers and supply chain professionals regarding how top executives and managers at companies utilize cloud computing and how trust maximizes goals for information sharing and ultimately impacts supply chain performance.

In the following sections we first discuss theory and model development in which we analyze the relationships between our constructs and their underlying theoretical foundations related to resource-based view and social capital theory. Next we identify past research on each construct and their potential relationships. We then discuss case study methodology as well as our data collection. Finally we summarize our findings and look at the potential limitations of the study.

THEORY/MODEL DEVELOPMENT

Resource-based View (RBV)

Resource-based view suggests that firms compete using unique corporate resources that are valuable, rare, difficult to imitate and non-substitutable by other resources (Barney, 1991; Conner, 1991, Schulze, 1992). However, while resources are important, it is more important how the firm uses these resources to maximize their competitive potential (Eisenhardt & Martin, 2000).

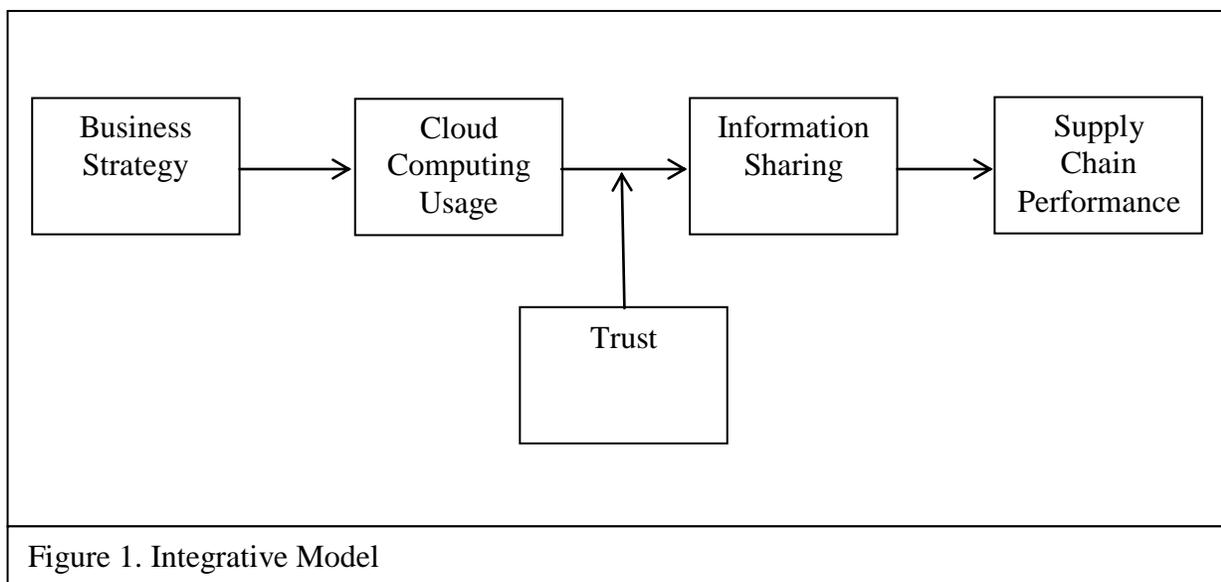
In this study we consider cloud computing technology using the organizing perspective. Cloud computing can be a valuable, rare and difficult to imitate resource if the firm utilizes it based on their own business strategy. Cloud computing technology can also be a resource if leveraged correctly that

provides foundations for greater information sharing in supply chains which leads to greater overall supply chain performance.

Social Capital Theory

Narayan & Cassidy (2001) define seven dimensions of social capital including: group characteristics, generalized norms, togetherness, sociability, neighborhood connections, volunteerism and trust.

Based on social capital theory, we propose a theoretical model as depicted in Figure 1. Inter-organizational trust is used as a social capital to moderate the relationship between cloud computing technology and information sharing. Additionally information sharing provides the foundations for greater inter organizational relationships decreasing problems in the supply chain including bullwhip effect which enhances supply chain performance (Lee et al., 1997a, b).



PROPOSITIONS

Business Strategy and Cloud Computing Usage

Walker & Ruekert (1987) differentiated five strategic types, based on Miles & Snow's (1978) work that was rooted in strategic choice theory. Previous research shows a connection between the way companies use information technology and business strategy. For example, IT applications have the potential to create differentiation across activities that will constitute a firm's value chain (Floyd & Wooldridge, 1990). Firms will tend to align their IT resources in order to position themselves favorably relative to rivals, suppliers, etc. (Floyd & Wooldridge, 1990). While alignment between a firm's strategy and its IT usage can lead to enhanced performance, misalignment has also been shown to reduce performance. Some studies have found that the misalignment between strategy and IT usage caused IT to become almost a competitive burden (e.g. Warner, 1987; Vitale et al., 1986). Overall, alignment between strategy and IT usage can lead to competitive advantage, avoid strategic disadvantage and enhance competitive position (Floyd & Wooldridge, 1990).

Based on this past literature we have formulated the following proposition:

Proposition 1: *Business strategy that includes the use of cloud computing will improve a firm's resource utilization.*

Cloud Computing Usage and Information Sharing

Cloud computing enables individuals or companies to lease infrastructure resources on demand from a virtually unlimited pool, using a pay-as-you-go billing model per unit of time (Rochwerger et al., 2009).

Prior research has explored the positive impact between IT and information sharing among firms. Clemons et al. (1993) suggest that IT has the ability to lower coordination cost without increasing transaction risk. Additionally, advances in IT have greatly enhanced information sharing capabilities (Lee & Whang, 2000; Leidner & Jarvenpaa, 1995). Research has identified cloud computing's potential impact on greater cooperation and coordination (Sahin & Robinson, 2002; Rochwerger et al., 2009; Vouk, 2008). Cloud computing has also been shown to be beneficial to biomedical information sharing (Rosenthal et al., 2010).

Based on this past literature we have formulated the following proposition:

Proposition 2: *Cloud computing usage is positively associated with information sharing.*

Moderating Role of Trust

There are numerous definitions of trust. While various definitions for trust exist, most scholars agree that confidence in the other party's credibility and good will are essential (Johnston et al., 2004; Gattiker et al., 2007). In this study we use Zhang et al. (2011) definition of trust as "a trustor's confidence and belief in credibility and goodwill of an object of trust." Credibility refers to the belief that the other party is dependable or reliable (Johnston et al., 2004). Goodwill refers to the belief that one party will act in the best interests of another, even if there is no way of monitoring behavior (Johnston et al., 2004; Ganesan, 1994; Baker et al., 1999; Zaheer et al., 1998; Sako, 1992).

Past research suggests that strategic alliances have high potential for opportunistic behavior and thus in order for information sharing to occur a firm needs to have confidence in its partner's behavior (Das & Teng, 1998). Trust has also been shown as a moderator between a firm's adoption of e-procurement to e-marketplace participation (Chang & Wong, 2010). Although adoption and participation is separate from cloud computing usage and information sharing, a connection exists through information technology (cloud computing usage and e-procurement adoption) and the implementation and result of information technology (information sharing and e-marketplace participation). Given that there is very little research in the supply chain management area with cloud computing usage, this past research suggests a potential moderating impact of trust on cloud computing usage and information sharing.

Based on this past research we have formulated the following proposition:

Proposition 3: *Inter-organizational trust moderates the relationship between cloud computing usage and information sharing.*

Information Sharing and Supply Chain Performance

In this study Zhou & Benton, Jr's (2007) definition information sharing is used, which organizes information sharing into three different dimensions: information sharing support technology, information content and information quality.

Previous research suggests that the degree of relationship among organizations in a supply chain has a significant impact on supplier satisfaction (Benton & Maloni, 2005). Additionally, stronger buyer-supplier relationships enhance supply chain performance (Benton & Maloni, 2005). Past literature also suggests that information sharing is vital to greater supply chain capability. Li et al. (2005) suggests that information sharing helps to create superior performance in supply chains because it allows for supply chain partners to work as a single entity. In addition it helps to break down functional barriers and engender cooperation to meet the requirement of customers (Flynn et al., 2010). Greater cooperation and integration thereby leads to process efficiency and logistics performance (Saeed et al., 2005; Germain and Iyer, 2006; Stank et al., 2001a, b).

Based on this past literature we have formulated the following proposition:

Proposition 4: *Information sharing is positively associated with supply chain performance.*

METHODOLOGY

The lack of research on cloud computing technology led to the selection of a case study approach based on grounded theory in resource-based view and social capital theory. In developing our case study protocol we used sections incorporating research and construct overview, topic, objectives, and data collection (Yin, 2009). Our case study protocol can be found in the Appendix- Table 1. Using a panel of experts, the questions were developed and structured from broad to detailed (Lockstrom et al., 2010). During and after coding the data we used multiple iterations through grounded theory (Glaser & Strauss, 2006). We also used existing literature to assess the causal relationships in order to establish adequate internal validity. We discussed both consistent findings as well as rivaling propositions with colleagues (Marshall & Rossman, 1995).

A multiple-case study approach was used, in order to increase external validity. Using a multiple case study approach allows researcher to analyze "within-case" analyses and a "cross case" analysis using replication logic (Yin, 2009; Lockstrom et al., 2010). To maintain reliability we developed a detailed case protocol to enable consistent data collection. We also used multiple researchers to code and analyze the data and also to cross validate recurring themes (Lockstrom et al., 2010).

Data Collection

In this study we used a representative case encompassing a holistic, multiple case study approach, because the purpose was to capture the circumstances in everyday, commonplace situations (Lockstrom et al., 2010; Yin, 2009). The participants in our study included organizations that used cloud computing technology for operations and were varied in size.

We conducted interviews over a two month period, and each interview lasted between thirty minutes and one hour. In order to ensure comparability and maintain consistency and flow, we used a semi-structured interview method (Yin, 2009). The interviewees ranged from top management to supply chain specialists who were aware of how their organizations utilized cloud computing technology and overall company strategy.

The researchers continued to interview until theoretical saturation was accomplished, that is until no new information could be gathered (Yin, 2009). Overall, interviews with six different individuals from four companies were made, which is considered adequate according to Yin (2009).

ANALYSIS OF RESULTS

After completion of each interview, the voice recordings were transcribed by two different researchers in order to ensure construct validity.

Company Retail

In Company Retail we interviewed a consultant from a consulting, technology services and outsourcing company which operates in over 200 cities in 53 countries who specifically worked for a retailer. It is a 4 billion dollar publicly traded company.

Company Truck

Company Truck provides tax services for small or individual trucking companies. Along with preparing returns, company truck offers customer free driver qualification tracking software, hours of service calculator and a fleet maintenance program wherever and whenever a trucking company needs it.

Company Transport

Company Transport is a holding company that offers its customers a range of transportation services including global, national, regional transportation as well as logistics with subsidiaries in the national, regional and international markets. Company Transport is a 2.69 billion dollar publicly traded company.

Company GPS

Company GPS provides navigation, communication and information devices and applications using GPS technology. The company is a 4.9 billion dollar publicly traded company.

Business Strategy and Cloud Computing Technology

Many of our interviewees stressed the importance of cost reduction and efficiency seeking methods prevalent in the defensiveness strategy. We interviewed a senior manager from Company Retail, which is a global management consulting and technology services company. The Senior Manager described their focus on cost reduction in their operations:

We are continually looking for areas where we can reduce costs and also become more efficient from an operating perspective.

Company Retail's Senior Manager suggests that this strategy impacts their use of cloud computing technology. In particular, Company Retail uses cloud computing technology to further the goal of not only cost reduction, but also greater efficiency through virtual services.

Like Company Retail, Company Truck, a tax software company, also considers both cost reduction and efficiency seeking as priorities for the firm. The cost reduction that cloud computing provides Company Truck is described by its Co-Owner as follows:

We are using infrastructure as a provider, called GoGrid, to replace all of our physical servers to run our applications on. ..In cost reduction, we replaced around 95k in hardware with a \$275 a month hosting charges.

Company Transport, considers itself an industry leader in information technology and a very early adopter of cloud computing. They identify with a cost reduction strategy in their operations. They also suggest that their use of cloud computing technology is driven by their strategy. Company Transport uses cloud computing technology to reduce several different types of costs, as suggested by the Vice President (VP) of International Marketing below:

One way to reduce cost and enhance efficiency is to implement and use information technology and information systems. We use cloud computing technology to reduce our company's overall costs. For instance, there is a drastic reduction in operational expenses. Hardware costs are also minimal. With a minimal maintenance cost, we can rely on the cloud computing services partner to look after our SCM related software applications, especially in overseas markets.

Company GPS, also enhances cost reduction and efficiency strategies through cloud computing, as the Director of Information Technology described below:

Cloud computing is very fit for our overall vertical integration business strategy in that it provides us with an efficient and cost effective platform to provide high quality services to various functional areas.

Risk aversion is another strategy type outlined by Miles & Snow (1978). Company Retail tended to be conservative in resource allocation decisions and product and market choice. This risk averseness has impacted their use of cloud computing technology. Company Retail is in a private cloud, where the private cloud is devoted to a single organization's internal use (Grossman, 2009). The use of a private cloud tends to be more secure in storing sensitive information and helps reduce potential security risks, including the ability of others to obtain sensitive information.

In terms of risk, Company Truck was very conservative. Originally, Company Truck considered the risk associated with their IaaS service to be the reliability of the cloud. This is not an uncommon worry with cloud computing users, as many are concerned about whether the service will be available or down during a critical time. However, with Company Truck the cost reduction benefit achieved from cloud computing technology far outweighed any risk associated with their cloud computing use.

Despite this Company Truck still monitors what information is stored in the cloud, given the amount of security risk that might perpetuate if not controlled. Some information they leave out of the cloud as described below:

There are only a couple of key pieces of information that is of personal value. We don't store credit card information...Other than that; we don't have any concerns about the cloud.

Unlike companies 1 and 2, Company Transport considers itself risk neutral. Company Transport tries to maintain a balance between being opportunistic, yet verifying security and risk issues with their information technology. With their use of cloud computing technology, there have been some trouble issues having to do with losing data as described by the Director of Supply Chain Management below:

We noticed that there have been a number of high profile incidents recently, where some of the largest cloud providers have had outages, and some even lost data.

In reaction to these problems, Company Transport utilized risk management tools to assess their information technology risk on different dimensions like technology, people and processes. In particular, they use risk assessment in their use of cloud computing technology in the areas of data integrity, recovery and privacy. Company Transport also uses a private cloud, which provides security, while occasionally using a public cloud for their customers. Their strategy is a balanced approach for taking advantage of opportunities and maintaining adequate security. Their cloud computing usage is also balanced through the application of a public cloud to enhance opportunities for greater exchange between themselves and their customers and a private cloud to maintain adequate security within the company.

On the other end of the spectrum is Company GPS, which, being an innovator and pioneer in the industry, is alert to pursue any market expansion opportunity. Within the past three years, they established a joint venture with Shanghai, and currently have subsidiaries in Taiwan and South Korea. According to their VP of marketing and Logistics cloud computing has enabled them to further their goal of vertical integration.

Although in the first adoption of cloud computing technology Company GPS used the private cloud for security reasons, they have now started to adopt the public cloud for external reasons. The Director of IT describes how they view the security of the cloud below:

Security is still an issue for executives considering the cloud, but it has dropped dramatically in importance. I think indicating it may not be as crucial a factor for companies that are considering public cloud services as it once was.

In interviewing our participants, we saw aggressiveness, as a key factor in the use of cloud computing technology. Aggressiveness was relatively constant between companies. Company Retail has a focus on maintaining a close watch on its competitors. They specifically sought out ways to maintain a strategic advantage over the competition. This strong competitive and aggressive focus impacts the way they use cloud computing technology. The Senior Manager describes their strategy as follows:

...we want to be able to continually push things into the stores. (We use cloud computing) to make sure our information is updated. We also use cloud computing to keep all of the applications in sync in all of the different locations simultaneously.

Company Truck also has to maintain its aggressiveness when dealing with constantly changing customer needs. Being a tax software service company, each year they must deal with new regulatory issues. At the same time, customers desire more in terms of access and speed of service. Cloud computing provides a platform that allows them to maintain an aggressive stance in changing their service in relation to their competitors.

Company Truck uses cloud computing to conduct computations that would normally take several hours. Cloud computing thereby allows Company Truck to improve overall computing and cost efficiency.

Company Transport also has an aggressive approach in reacting to changing customer needs. In response to this growing market need Company Transport uses information technology to maximize the overall efficiency of business processes. Cloud computing technology allows Company Transport to discover and adapt to regulatory changes and to lower costs, which are passed onto their customers.

Like aggressiveness, proactiveness, or flexibility in changing environmental trends, varies between companies and also impacts the use of cloud computing technology. Company Retail's Senior Manager describes their use of cloud computing below:

Since (using cloud computing) we've been able to centralize a lot of our functions to reduce energy usage.

Company retail has a proactive stance in sustainability and reducing their carbon footprint. This impacts their usage of cloud computing by focusing on reducing their carbon footprint via centralizing systems and reducing energy usage.

Another strategy type that was discussed in our interviews, as well as in Miles & Snow (1978), was analysis. There were several different ways our interviewees discussed in terms of problem solving strategies.

Company Transport discussed hiring external consultants that were technology experts in solving problems and difficulties associated with information technology. This allowed them to concentrate on their core competency, rather than having to worry about issues that were beyond their normal knowledge managing practices. This problem solving behavior also impacted the way they used their cloud computing technology. Instead of focusing on the how and why of cloud computing usage, they concentrated on vendor selection and risk management associated with its use. The VP of International Marketing describes this below:

We need to rely on our vendors if services provided by them are woven into business processes. So choosing a supplier for cloud computing services in our organization has to be done with the idea of a long-term relationship in mind.

Futurity was the last strategy type discussed during our interviews. Company retail has a short term viewpoint that breeds a concentration on efficiency of operations. In terms of cloud computing usage, it also impacts the way they view the short-term use of cloud computing technology. They change the focus from questions such as “Will I need as many servers in the data centers” to “Will I be able to operate the data centers at a different manner over time in the short-run to run operations efficiently?”

Company Transport, on the other hand, focused on both short-term and long-term strategies. For Company Transport, cloud computing provides a platform for supply chains to become more dynamic, scalable and capable of supporting their objectives in cost reducing, efficiency and in being the leader in IT innovation for both the short-term and the long-term.

Given the interviews we can confirm our proposition 1 that business strategy does have a direct impact on the way cloud computing is used within firms.

Cloud Computing Usage and Information Sharing

Company Retail uses a private cloud with vendor portals which allows other information to be shared with organizations that have a password.

This private cloud usage impacts the way they share information and what types of information they share with vendors as Company Retail’s Senior Manager described below:

The vendor can obtain information whether it is purchase order information, routing information for shipments, status of orders, or status payments.

Cloud computing provides a platform for companies to access information at any point in time, even at different locations. Company Retail’s private cloud computing offers ease of access to information without the security risks associated with public cloud computing. This also impacts Company Retail’s sense of security when sharing information with other users as described below:

We’re pretty comfortable with (sharing information) by giving each of the individual organizations their unique log on and password, so that they can only see their information and their data even though it’s in a much larger database environment.

Company Transport also has various usages for cloud computing technology, including: facilitating process integration with the help of enterprise resources planning; enterprise application integration and greater information sharing through greater coordination of efforts between supply chain partners to respond to customer needs; greater availability of strategic and tactical data for other members in the supply chain. Moreover, according to their VP of International Marketing cloud computing has provided Company Transport greater competitive advantage in customer relationship management.

Company GPS, which uses both web-based cloud services and SaaS, suggests that cloud computing provides them a “clear edge” in globalization efforts by allowing for greater communication between firms in the supply chain.

Based on these interviews, we can confirm proposition 2, that cloud computing is positively associated with information sharing among supply chain partners.

Inter-Organizational Trust of Cloud Computing and Information Sharing

Both dimension of inter-organizational trust including credibility and good will were mentioned during our interviews. Company Retail's senior manager describes the relationship with suppliers and clients as follows:

We like to feel that all of our clients and all of our suppliers are credible, and they all desire to put forth their best foot.

In order to verify trust, Company Retail researched its partner's financial situation to discover any underlying problems as described below:

There are times, as with any business, you'll find that when trouble does arrive they may be reluctant to put information forward. And you'll start to see that with untimely delivery to make shipments. You'll start to see issues from that perspective. At that point we start to take a look at their financials for a better understanding of what's going on with their business.

Company Transport was similar to Company Retail in their inter-organizational trust mentality with supply chain partners and using cloud computing to communicate information sharing. Company Transport asks vendors to maintain adequate standards in terms of protocol and data formats, and they have to be certified and presented publicly to the company. While these certifications are costly, they are also critical for adoption, because they build the foundation of service level agreements between suppliers and buyers in the supply chain, thus, enhancing information flow and business.

Company GPS also believes in the importance of trusting one's supply chain partners. Company GPS treats its suppliers and buyers as business partners with the same goals and purposes in mind. Trust is of utmost concern when dealing with using IT such as cloud computing to facilitate information flow between partners as the VP of International Marketing and Director of IT describe below:

Any one of our IT partners can undermine our security...Before we can start to share information there has to be trust between the various links in the supply chain.

Given the security risk that often comes with cloud computing technology, including vendors that crash systems, corrupt data or allow an attacker to get access to the system, it is vital for Company GPS to maintain a trusting relationship before they use cloud computing to communicate with firms. The VP of International Marketing describes this below:

Almost everything we will talk about in supply chain management is predicated on being able to share information openly with the appropriate members of the chain. In other words, trust is then a key foundation of supply chain management.

Based on these interviews, we can confirm proposition 4 that inter-organizational trust moderates the relationship between cloud computing usage and information sharing.

Information Sharing and Supply Chain Performance

Company Retail described information sharing support technology as consisting of vendor portals in their private cloud. Vendor portals are gateways that can be accessed by the partners, each using their

own specific user names and passwords for added security. In these vendor portals individuals can access information, including shipping information and status of orders. Using these vendor portals has enhanced Company Retail's relationship with their partners according to their senior manager.

Company Transport also suggests sharing important information like sales forecasts, marketing strategies and inventory levels with supply chain partners using cloud computing technology.

The Director of Supply Chain Management describes the importance of information sharing as follows:

Since building up new capacities in large quantities takes up to years, forecasting demand is vital for providers of computing power and they (supply chain partners) invest great efforts in this.

Company Transport also suggests there are two types of information sharing: sequential information sharing and reciprocal information sharing structures. In sequential information sharing the output of one partner's activity flows to the next partner as an input, and this continues as a sequential process along the supply chain. In this case they rely on electronic data interchange. However, reciprocal information sharing is more complex, considering information flow is bi-directional and partners communicate with several others, which may cause inconsistencies regarding the information of different partners. In this case cloud computing is more useful as a tool to prevent inconsistencies as described below:

To reduce uncertainty and conflict in collaboration, the best coordination mechanism for partners is to synchronize and integrate the interactive processes using cloud computing architecture.

In this case inconsistencies are eliminated via a centralized data point. Multiple partners through a public cloud can gather accurate information and increase performance by using information sharing support technology or cloud computing.

Information content is another facet of information sharing. It is defined as the content exchanged between firms in the supply chain (Zhou & Benton, Jr., 2007). Company Retail describes sharing future demand, shipping information, status of orders and other content as stated which improves their demand forecast accuracy. This directly may impact the bullwhip effect which Lee et al. (1997a, b) describes as oscillating demand amplification upstream in the supply chain. This ultimately improves supply chain performance.

Along with appropriate information content, another aspect important for reduction of bullwhip effect, and improved supply chain performance, is information quality.

Information sharing as a whole, and information quality as a part, was described by Company Transport as helping to achieve an effective way to reduce uncertainties in the supply chain and counter problems like the bullwhip effect. The Director of Supply Chain Management described how information sharing, the right way, allowed for greater efficiency:

Information sharing ensures that the right information is available for the right trading partner in the right place and at the right time. We use information sharing to prevent, detect and resolve exceptions spontaneously and create unprecedented levels of efficiency in collaborative supply chains.

Greater information quality and flow between each supplier and Company GPS gives the supplier a higher rating. During the last two years Company GPS carried out two initiatives. The first initiative was to integrate the company's internal information repositories and centralize relevant forecast and transactional information through customer relationship management. The second initiative was to foster greater information integration among external partners in the supply chain with cloud computing technology. The VP of International Marketing and Director of IT suggest that not only has greater information flow reduced price variations and rationing game strategy, which are two main causes of the bullwhip effect, greater information flow has also improved overall accuracy in information, thereby reducing the bullwhip effect. In addition with the bullwhip effect, information sharing improves other facets of supply chain performance

Communication is one dimension of supply chain performance and involves "frequent, genuine and involving personal contracts between buying and selling personnel" (Chen & Paulraj, 2004, p. 126). Communication improves supply chain performance through active information sharing between partners. As mentioned previously, cloud computing technology helped to facilitate active information sharing with Company Retail and its partners that have vendor portals where information can be accessed from any place at any time.

Along with the importance of communication is involvement, which refers to the amount of supplier/buyer participation in the decision processes of certain firms. Company Retail has a strong reliance on its supply chain partners as evidenced by their involvement with them. By continually polling supply chain partners both downstream and upstream they are able to maintain accurate demand forecasts, as well as remain alert to constantly changing market trends. In return Company Retail makes more accurate decisions based on buyer feedback.

Integration of logistics calls for organizations in the supply chain to maintain integration so that the necessary quantity of goods is in the right place at the right time (Chen & Paulraj, 2004; La Londe, 1983). Company Retail focuses on the importance of adequate information sharing provided by vendor portals in on time delivery performance, which the senior manager describes as being "typically very favorable" with regard to the company:

That private cloud allows those carriers (partners) to come in and schedule their times as opposed to having to answer a phone call or work off an excel spreadsheet.

Cloud computing enhances speed and efficiency in information sharing between Company Retail and its suppliers, and this helps to increase not only relationship, but also operational aspects in the supply chain. Along with the relationship aspects of supply chain performance operational measurements were discussed during our interviews.

Company Transport considers several aspects of supply chain performance, including revenue, market value, return on assets and return on stockholder investment, all of which is benchmarked through the use of cloud computing that impacts information sharing. The VP of International

Marketing describes the company's success and how cloud computing has helped achieve this as follows:

We enable firms to achieve reduced operating costs and increase revenues in new and existing markets. We also provide firms an opportunity to enhance their market value by reducing ownership of assets, which translates to a higher return on remaining assets and greater return on stockholder investment. We also bring to the relationship our specialized expertise in managing logistics with contemporary technology and systems, including cloud computing.

This ability to improve value through decreased costs and increased revenues with greater information flow between supply chain partners has also allowed Company Transport to benchmark in both delivery cycle time and responsiveness to customers.

Based on these interviews we can confirm proposition 5 that information sharing is positively associated with supply chain performance.

CONCLUSIONS

This paper sought to answer four particular questions: (1) How does business strategy impact cloud computing usage? (2) How does cloud computing usage impact information sharing among supply chain partners? (3) Does trust have an impact on the relationship between cloud computing usage and information sharing? (4) How does information sharing via cloud computing technology impact supply chain performance in an operational and relational sense?

In examining the first question, we found that each strategy had an impact on the way cloud computing was used. All four companies placed an emphasis on cost reduction and efficiency seeking methods in the defensiveness strategy type. Additionally, the vast cost saving benefits provided by cloud computing technology was stressed in each of the interviews. While some companies were conservative in decision making, others were more prone to taking greater risks. The conservative organizations opted for private cloud computing for security measures, while the more risk taking companies gradually became involved in public cloud usage. Cloud computing was also used as a tool for increasing market territory and information flow between new subsidiaries. The firms higher on proactiveness noted the pro-environmental impact that cloud computing provides in reduction of the carbon footprint through reduced energy usage. Additionally, cloud computing provided a platform for a problem solving strategy, particularly through communication and mirroring the company's strategy in regard to short-term versus long-term focus.

In examining the second question we found that all cases implied cloud computing greatly enhanced information sharing among supply chain partners. Cloud computing provided firms the ability to share information internally and externally throughout their companies and supply chains.

In examining the third question we found several of our cases indicated security issues prevalent with the use of cloud computing technology, especially through public cloud use. Company GPS specifically mentioned that trust was of paramount importance in information sharing with supply chain partners.

Lastly, in examining the fourth question there were several topics discussed regarding information sharing, including information sharing support technology, content and quality. These topics were also discussed as being crucial elements with regard to information flow throughout the supply chain (Zhou & Benton, Jr., 2007).

APPENDIX

Table 1. Protocol

Questions	Adapted using information from: Miles & Snow (1978); Cao et al. (2011); Ellram et al. (2007)
Business Strategy	
1. Is cost reduction or efficiency seeking methods a priority for you firm?	
2. How does this method impact your use of cloud computing technology?	
3. How would you assess the way your company handles risk in the decisions that you make?	
4. How has this impacted your overall usage of cloud computing technology?	
5. What is your perception of risk associated with cloud computing technology?	
6. How does your firm react to changing market positions in comparison to your competition?	
7. How does your reaction to changing market positions impact your overall cloud computing usage?	
8. How does your company respond to changing environmental trends?	
9. How does this response impact your overall cloud computing usage?	
10. Does your company actively seek out market opportunities available to you?	
11. How would you assess the problem solving behavior of your firm dealing with supply chain management issues?	
12. How does this behavior impact your use of cloud computing usage?	
13. In strategic decisions, does your firm focus on effectiveness (long term) or efficiency (short term)?	
14. How does this impact your use of cloud computing technology?	
Cloud Computing	Adapted using information from: Foster et al. (2008); Mell & Grance (2009); Ellram et al. (2007)
15. How has cloud computing technology impact your overall performance in terms of overall competitive advantage?	
16. How has on demand information provided by cloud computing impact information sharing and the relationship among you and your supply	

chain partners? How has it impacted your firm in terms of overall competitive advantage?

17. How has having pay as you go service provided by cloud computing

impacted information sharing and the relationship among you and your supply chain partners? How has it impacted your firm in terms of overall competitive advantage?

18. How has having massively scalable information services provided by cloud computing impacted information sharing and the relationship among you and your supply chain partners? How has it impacted your firm in terms of overall competitive advantage?

Information Sharing

19. Are there any concerns about the cloud that affects your information sharing among you and your supply chain partners?

20. How would you assess the overall information sharing capability that your firm has with supply chain partners? Including quality, content of the information

21. How has cloud computing impacted information sharing in your organization?

Adapted using information from: Zhou & Benton Jr. (2007)

Trust

22. How would you assess the relationship you have with your supplier in terms of your belief of their credibility, dependability and desire to do good? How has this relationship impacted information sharing between you and your supply chain partners? How has cloud computing impacted this relationship?

Adapted using information from: Zhang et al. (2011); Mayer & Gavin (2005)

Supply Chain Performance

23. How would you assess the performance of your supply chain?

24. How would you assess your company's relationship with your suppliers?

25. How would you assess the accuracy of demand forecasts in your firm?

26. How has the following impacted the accuracy of your demand forecasts: relationship and information sharing with you suppliers?

Adapted using information from: Kroes & Ghosh (2010); Chen & Paulraj (2004); Lee et al. (1997a,b)

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