

## The Impact of E-Commerce on Supply Chain Costs

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**Abstract:** This paper assessed the impact of Electronic Commerce on supply chain cost, a case study being in China. The research study has highlighted how E-commerce helps to reduce those costs which are mostly incurred in the whole process of supply chain right from placing the order to executing it. The E-commerce environment was recognized as highly unclear, stopping from increased information visibility and dynamic market structures. A stronger attention on relationship supply chain as part of business strategy enables managers to manage costs better.

**Keywords:** E-Commerce, supply chain costs

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### I. Introduction

E-Commerce has both positive and negative impacts towards business, it makes simple for businesses to cover a much wider number of people present at less expense than would be required if the traditional retail method was to be applied. With E-Commerce, there's no need to facilitate physical expensive shops as everything can be done online. All Business transaction are facilitated through internet (online) in which the information is exchanged online the same as goods, services or money. E-commerce is categorized through the following groups

**Business-to-Consumer (B2C)** In this category the company is trying to sell consumer products to selected group of internet followers who are willing to buy it online. **Business-to-Business (B2B)** in this mostly is between businesses, interaction with suppliers or between trading partners and **Business-to-Administration (B2A)** A third category of E-commerce is in which the business community interacts electronically with public sector organizations. Submission of planning applications, VAT returns, income tax, or patent registration, all come within this category and B2A applications have the potential to bring even more companies into the world of electronic trading.

Supply chain includes all of the parties involved either direct or indirect, in fulfilling a customer request, not only manufacturer and suppliers but also transporters, warehouses, retailers and the customers themselves. According to Alexander Harsono Supply Chain Management is a tactical and strategic management philosophy that seeks to network the collective productive resources of intersecting supply chain systems through the application of integrative business technologies in the search for innovative solutions and synchronization of channel capabilities dedicated to the creation of unique, individualized source of customer value [1]:

Supply Chain Cost are those costs incurred in the whole functioning of the supply chain beginning from placing the order to executing it. It includes all the costs the company needs to incur for the successful functioning of the Supply Chain team in the organization. Different electro-activities from Internet (web page) creation to supply chain management are basically divided into five elements, namely:

- Ordering process
- Materials Acquisition
- Inventory Management
- Manage supply chain finance and planning
- Manage Supply Chain related IT costs.

### II. Literature Review

Literature review is the review part which focuses on how other authors has explained on various issues, terms and key elements, Kombo and Tromp, (2006:62). Literature review enable researcher to know the kind of additional data needed to the study, this avoids duplication of work. In this paper, the review of different literature like books, journals, on-line materials have played a greater role on helping to establish the research gap that is to be explored.

### E-COMMERCE

E-commerce has become a widely accepted method for business operation. Till 2005 most of the research in e-commerce was exclusively conducted in the western world (Molla, and Licker, 2005). the statement is very true as most of the people are even forgotten how physical stores are look like. The introduction of e-

commerce in the business has participated effectively in reducing the cost and maximizing the revenues of firms. Even though most of the firms use e-commerce for online buying and selling, however, it can be used in other areas such as logistic outsourcing (Cho, Ozment and Sink, 2008). The performance of e-commerce is dependable on many factors that can increase the deployment of e-commerce (Salwani et al., 2009) [2]:

Emergence of the Internet, particularly "Electronic Commerce" application brings new landscape in conducting business. E-Commerce is becoming an important factor in developing business domestically or internationally (Mohamad and Ismail, 2009). Zerenler and Sahin (2013) refers that the e-Commerce concept has been broadly defined in various ways. Laosethakul and Boulton (2007) defined it as one of the most visible examples of the way in which ICT can contribute to economic growth, it helps countries improve trade efficiency and facilitates the integration of developing countries into the global economy, also allows businesses to be more competitive.[4]:

In fact, the benefits of e-Commerce is emphasized by most literatures, which are classified in two main categories: (1) Tangible benefits: Business efficiency, increased automation of processes, transformation of traditional market chain, retained and expanded customer base, reduced operation costs and acquisition of a niche market and (2) Intangible benefits: Enhancing well-being and education of customers, consumer loyalty and competitive advantage and convenient shopping (Kuzic et al., 2002)[4]:

The explosive growth of e-commerce has already had a profound effect on retailers and manufacturers as manufacturers seek to reach their customer as quickly and cost-effectively as possible. And this is just the beginning. Changes are therefore needed in our industry to address the evolving expectations and to capitalize on e-commerce growth: end-to-end track & trace, reliability in delivery time, smooth cross-border operations [3]:

"E-commerce businesses are fast gaining grounds and changing the way of doing business" (Angela Scott, 2017).is the leaving truth that E-commerce has a significant impact on business costs and productivity as people can easily finish transactions even close deals through online windows. "E-Commerce has a chance to be widely adopted due to its simple applications. Thus, it has a large economic impact" (Rajneesh Shahjee, 2015). As I'll be investigating how e-commerce has impact in china suppliers it's true the in anyway it plays a big roll on boosting economic development with the country wise. It is very crucial to know that e-commerce as most of literature consider it as the tool which if applied well can lead to economic and even social growth, so how does this tool help minimize cost when it comes to supply chain.

## **SUPPLY CHAIN MANAGEMENT**

Supply Chain Management is a tactical and strategic management philosophy that seeks to network the collective productive resources of intersecting supply chain systems through the application of integrative business technologies in the search for innovative solutions and synchronization of channel capabilities dedicated to the creation of unique, individualized source of customer value. SCM has become today's most important management concept because it enables enterprises to exploit the explosion of technology tools that are transforming the realities of the twenty-first century marketplace[1]:

A supply chain is the network of activities that deliver a finished product or service to the customer. These include sourcing raw materials and parts, manufacturing and assembling the products, warehousing, order entry and tracking, distribution through the channels, and delivery to the customer [6]: "Supply chain management is seen as a tool that will help develop strong ties with suppliers and customers since the management and flow of materials within organizations is increasingly extended beyond the borders of the firm to involve upstream and downstream activities" (Lamming et al., 2000). Companies that have been successful in reducing cost fulfilled that it is not enough to just reduce expenses to remain competitive, rather it takes innovative measures to emerge as leader, this is why the role of knowledge advisory groups is so important .they help provide a much needed innovation and structured program, designed through proven tools and different strategies

The performance of Supply chain is based on each member and this causes many companies to invest in their supply chains in order to create a good framework and empower total performance towards the competition with other chains. Members In supply chains world do not depend on single decision maker, due to this challenge, researchers and other scholars to persuade the autonomous members of the supply chain act under one policy.

## **E-COMMERCE AND SUPPLY CHAIN**

The E-commerce is the backbone of Supply chain management, as the markets keep on growing and reaching in billions less than a decade, it is clearly that manufacturers are not blind with the importance of supply chain management solutions to update the performance of total supply chain with the support of E-commerce. Linked e-commerce and supply chain systems is the backbone to win the businesses objectives and to beat competition in the brutal business environment.

E-commerce will have wide-ranging impacts on supply chain management. Fortunately, the Internet of Things (IoT), big data, and fully integrated supply chain systems have the potential to meet these demands, and e-commerce will effectively change supply chain management forever. E-commerce will have wide-ranging impacts on supply chain management. Fortunately, the Internet of Things (IoT), big data, and fully integrated supply chain systems have the potential to meet these demands, and e-commerce will effectively change supply chain management forever [5]:

A prime example of E-commerce role in Supply chain management which provides the Dell with a sustainable, competitive advantage, such as quick response time, low cost, state of the art quality design, or operational flexibility. Dell Computers Corporation is a good example of a company using its supply chain to achieve a sustainable competitive advantage.

Quick delivery of customized computers and laptops at prices 10-15 percent lower than the industry standard is Dell's competitive advantage. A customized Dell computer can be en route to the customer within 36 hours. This quick response allows Dell to reduce its inventory level to approximately 13 days of supply compared to Compaq's 25 days of supply. Dell achieves this in part through its warehousing plan. Most of the components Dell uses are warehoused within 15 minutes travel time to an assembly plant. Dell does not order components instead, suppliers restock warehouses as needed, and Dell is billed for items only after they are shipped. The result is better value for the customer [6]:

Even though this case is not very new, still very few researchers have addressed the impact of E-commerce on supply chain costs. As many companies try to achieve success in managing relationships within their supply chains, the E-commerce environment presents organizations with different dynamics to manage. I conducted a qualitative research study to determine how E-commerce companies recognize the new environment and to examine how they are managing relationships in their supply chains under these new conditions. The purpose of this paper is to build a grounded theory of the impact of E-commerce on supply chain cost by using the study findings, supported by existing research in e-commerce and supply chain management.

The following section outlines the methodology used for the grounded theory study. Then I will present findings on the E-commerce environment that emerged from analysis of data collected from different companies and from existing literature. In the fourth section, I discuss the impact of this environment on relationship supply chain as reported by the companies studied and supported with transaction cost economics and resource dependence theories. Then I will offer implications of this research for both practitioners and researchers based on the findings. Finally, limitations and opportunities for future research are presented.

### **III. Methodology**

An exploratory research study was conducted to examine the impact of the dimensions of E-commerce on the supply chain Cost. Because the purpose of this research paper is to develop understanding of this new phenomenon, adopted a theory-building, qualitative research design. Qualitative methods are ideally suited to research substantive areas about which little is known (Stern, 1980). Strengths of qualitative research include realism, significance, richness, high face validity, and potentially a more precise way to assess causality (Miles, 1979). Such strengths are attributed to the fact that the data come directly from the participants involved in the phenomenon. The findings are, therefore, not anecdotes, but rich verbal descriptions reported in the words of the informants, often incorporating direct quotes. Verbal descriptions offered in the findings are illustrative of repeated patterns along with their contextual variations that emerge from the data. These descriptions are systematically analyzed to develop theoretical relationships among the themes and provide important implications for practice and research. Weaknesses to qualitative research that need to be considered during the research include an overabundance of variables due to the amount of data, and a lack of control (Miles, 1979).

Specifically, the qualitative method of grounded theory is helpful in understanding processes people use to cope with, respond to, or alter their environment. "Social phenomena are complex: Thus, they require complex grounded theory. This means conceptually dense theory that accounts for a great deal of variation in the phenomenon studied" (Strauss, 1987). Thus, it is the appropriate methodology for a new and previously unresearched phenomenon such as E-commerce. Grounded theory is the process by which theory is derived from data, systematically gathered and analyzed through the research process (Strauss and Corbin, 1998). It was chosen for this research project because it helps interpretive analyses and facilitates theory construction, the two objectives of this research project. The rest of this section describes the general methodology of grounded theory followed for this project, the sampling procedures and details of the data collection process, the data analysis procedures, and the steps taken to ensure quality of the interpretations

Grounded theory starts with choosing the phenomenon to study; in this case, the phenomenon is the impact of e-commerce on supply chain costs. The next step is to choose a setting likely to contain the phenomenon in varying states. The setting for the present research is described in detail to the sample section. Interviews are the primary data collection method used for grounded theory, along with document examination,

review of relevant literature, and informal observations (Strauss and Corbin, 1998). Using multiple data sources allows for triangulation in data analysis, which provides more evidence to support the developing theory. For this study, interviews were conducted, company documents were reviewed where they existed, and literature on E-commerce and supply chain management was examined.

Literature review on E-commerce and supply chain management concept, the combination of e-commerce into the supply chain, and the part of E-commerce in the supply chain management were chosen due to the reason that together they are making a large impact on one another.

### **STATEMENT OF THE RESEARCH PROBLEM**

Different studies have pointed the relationship between E-commerce benefits and supply chain management. These relationships were examined in different markets but as the digital economy keep of growing, different people and businesses around the globe are going online. The number of Internet users in China is about 804.5 million in 2018. This has led to the explosive growth of the Chinese e-commerce markets, which is currently a global leader in both American and in the European. The total number of online customers in China increased from nearly 46 million in 2007 to more than 533 million in 2017, generating over one trillion Yuan in online B2C retail revenue quarterly.

Growing popularity of e-commerce among Chinese consumers is likely related to the increasing number of E-commerce platforms and apps, convenience, accessibility, and extremely user-friendly digital payment options. As of 2017, about half of the populations were using e-wallet for payments. “As of 2018, multinational conglomerate Alibaba.com is the most successful e-commerce company in China. Alibaba dominates the B2B market and it’sTmall and Taobao websites also enjoy the biggest market share of the B2C and C2C markets respectively” (2019 statista.com).

**General Objective** The general purpose of this study is to examine the impact of E-commerce on supply chain Costs.

*Specific Objectives* of the study is to;

Determine the importance of E-commerce to the supply chain management.

Determine the roles of E-commerce on costs of supply chain.

To examine factors that will led to supply chain cost reduction through E-commerce practice

Based on the above, the researcher has demonstrated the study problem via stirring up the questions below:

First question: To what extent E-commerce affect supply chain management?

Second question: To what impact E-commerce affects supply chain costs?

Third question: Is there any relationships between E-commerce activity and supply chain costs?

### **STUDY HYPOTHESES**

Based on the study problems and the literature review, the research hypotheses are:

H1: E-commerce impacts have a positive direct effect on supply chain costs

H2: E-commerce benefits have a positive direct effect on supply chain

### **CONCEPTUAL FRAMEWORK OF THE STUDY**

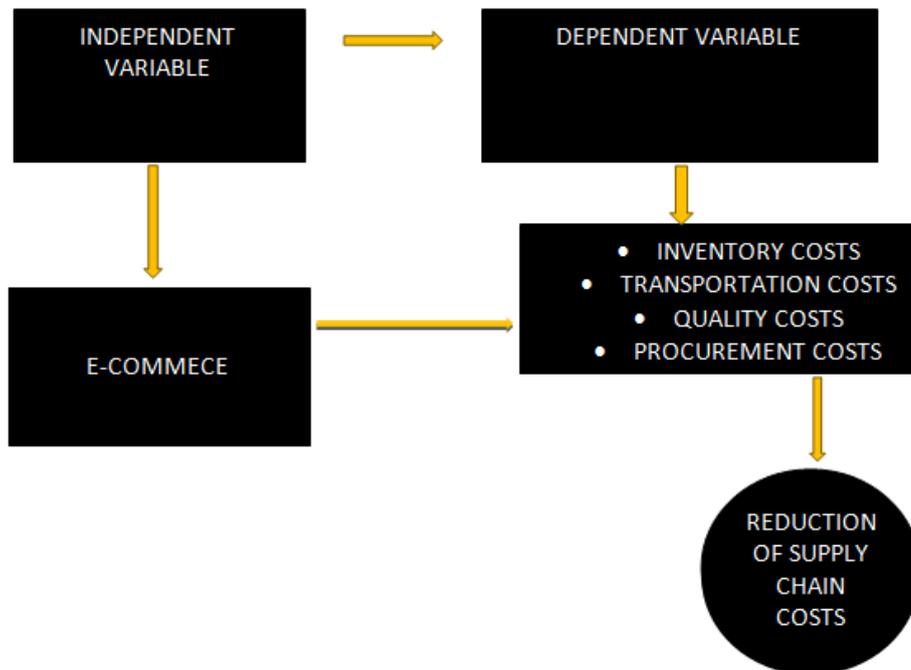
This study has three variables which are Independent, Intervening, and Dependent variable which are as follows:

#### *INDEPENDENT VARIABLES;*

These are those variables that cause changes in the dependent variables or when manipulated cause changes in the dependent variable. Thus, an independent variable is presumed to affect the dependent variable.

#### *DEPENDENT VARIABLES:*

These are presumed to affect the dependent variable. Therefore, a dependent variable is a variable whose outcome depends on the manipulation of an independent variable.



Complexity in supply chain management Modern technologies in communication and information create considerable changes in the field of cooperation among companies. Other companies based upon traditional strategies found little advantages and shorten lifespan of products and lack of customers' loyalty, and little product replacement costs accompanied with other threats. Therefore, it is necessary to apply new cooperation models in the format of supply chains.

Electronic supply chain is one of the most effective guidelines in this regard. Generally an electronic supply chain is a combination of temporary and related members (from geographical point of view) and by the use of IT for satisfying market needs and providing suitable competitive advantage for their members. Any creation of electronic supply chains needs a lot of reflective cooperation and better combination of organizations and temporary unity of communicative networks. Any lack of effective management in controlling and leading of cooperation among chain partners may cause further failures in business.

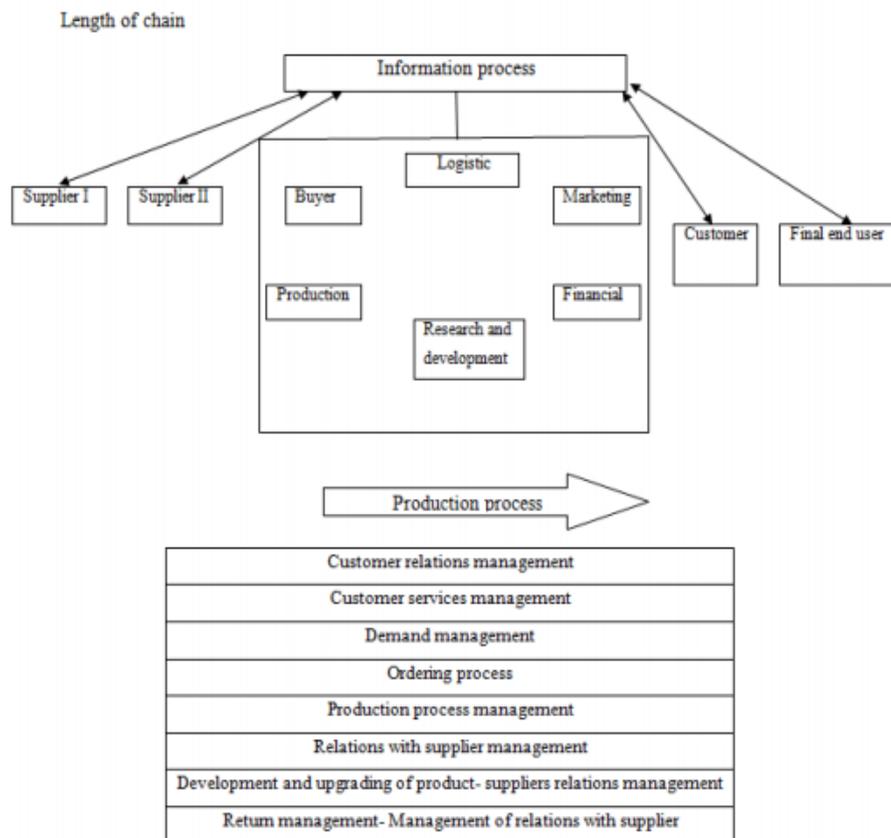
Therefore it is necessary to write and apply suitable cooperation strategies in compliance with real nature of supplying chain. Recently both concepts of designing and supply chain management changed to operation paradigms. This is more serious with the development of information and communication technologies including electronic data transfer, internet and world network. Then it may cause increasing complexity of systems effectiveness on buyer – supplier relations.

Complexity of supply chain management makes companies to improve on-line communication systems. For instance, internet may increase any relations through more interaction among companies and customer. Timer points out to the role of internet in providing a powerful supplying chain from commercial point of view in order to remove any challenges of virtual institutes. Other researchers intend to provide different methods for controlling of electronic data transfer. Some of them believe that now is the time for the movement of supply chain towards on-line commercial societies. For example, general electric business network is an on-line commercial society that enables company to perform \$ 1 billion commercial transactions with suppliers throughout the world on electronic and on-line basis. Supply chain management focuses on general and long-term benefits and advantages for all members through cooperation and sharing of information. This may reveal the importance of communications and IT application in supply chain management. It is necessary to increase information sharing among supply chain members in order to reduce lack of insurance and increase the function of suppliers with high level and betterment of its functions.

### IMPACT OF E-COMMERCE ON SUPPLY CHAIN MANAGEMENT

The impact of e-commerce on supply chain management is special and it may practically facilitate any inter-organizational communications and reduce time intervals with further cooperation. E-commerce is a chance for an organization which intends to develop its markets throughout the world. When a company specifies its products and services, it is possible to expect an increase in demands. This is the responsibility of supply chain management system to reply all increasing demands in an effective form. Also, supply chain management should be on-line enough to reply all special necessities of customers. This is possible through

programming systems and/or virtual agencies. E-commerce will extend further communications and network opportunities. E-commerce supports complete integration of commercial partners. This type of business may increase the costs. Furthermore e-commerce makes an increase in group works and new relations between management and customer for designing of new products and better feedbacks of customers. Therefore it is possible to have effective reply to the changing markets. Regarding the current process of e-commerce, there are great numbers of companies which are intending to sale their services and products by electronic means. There are various e-commerce types which are different from each other based upon their type of transactions. For instance, agency to agency, customer to agency and customer to customer are different models of e-commerce.



INTEGRATION FORM OF SUPPLY CHAIN MANAGEMENT AND RELEVANT PROCESSES IN CHAIN.

Figure above shows the relationship between output structure of chain members and supply chain processes. Current operational fields in the supply chain are as follows:

- Marketing and financial sale.
- Research and development.
- Purchase and logistic.
- Business processes.

All the above-mentioned items are collection of different activities for value Creation for customers throughout the supply chain (Razmi and Dehghan, 2004) Table below.

<b>Applicable fields of the organization</b>	<b>Effects of e-commerce</b>
Marketing	Development and distribution of product, new sale channels, direct economy, reduction in flow time order, increasing service level to customers, internet sale, sourcing new market parts and finding new markets
Research and development	Receipt of feedback from customer, research about customers' necessities, product planning, QFD, data research, time engineering, customer relations management, time reduction and increasing the precise planning of a new product
Purchase/supplies	Ordering, transfer of money, appointing of supplier, reducing bureaucracy, short-term of order flow, increasing cooperation of buyers-supplier, betterment of inter-organizational processes, removing the intermediates, receipt of consultants based upon buying, transfer of power from seller to buyer
Stock management	Visibility, quick transfer of information and reduction of stock, reduction of updating costs and pricing, on-time delivery, reduction of warehousing costs, ordering, accounting and customer processing
Transportation	Browsing the raw materials orders, reducing loading and unloading timer, transportation management, assignment of transportation activities
Customer servicing	Wide information to customer, browsing the order by customer, quick reply to the customers' questions
Relations among suppliers	Reduction of ordering costs and receipt of bill, Increasing the coordination and cooperative business, betterment of ordering flow, betterment of completion process and product delivery
Production	Electronic construction and production, Assignment of sale, pure production (through cooperative production programming, internet holder, mass ordering, sale transactions, quick transfer of qualitative problems in introducing of standard chain and qualitative definitions of knowledge management chain

E-commerce and internet are influenced in supply chain economic efficiency in five ways as follows:

- Reducing the distribution and transactions costs.
- Increasing the speed of product development.
- Providing more information for buyers and sellers.
- Increasing the options of customer and their access to suppliers.
- Reducing the time intervals.

**WILLARD BISHOP MICRO ABC MODEL.**

Using retailers' brick and mortar and E-Commerce operating reports, onsite observations, and industrial engineering time and motion studies, Willard Bishop identified 28 major processes and activities that directly support E-Commerce programs in distribution centers (DCs), dark stores, and live stores across six retail chains: five local/regional grocery brick and mortar retailers and one regional pure play eRetailer. These processes and activities were used to determine the cost to pick and fulfill online grocery orders across seven different E-Commerce programs (see box). Willard Bishop also leveraged E-Commerce transaction data from their 2015 E-Commerce ABC Standards research to determine average order size and product mix across the various programs. All conclusions are based on the six participating retailers cost data and demographics. Although this sample is representative of today's E-Commerce programs at brick and mortar locations, results will vary by eRetailer and by supply chain.

These two approaches to E-Commerce operate under very different business models but, they have one thing in common: they are making online shopping more convenient and the fulfillment process easier than ever before.

**Two Inventory and Four Delivery Models**

Fulfilling online orders requires a source for product and a way to get orders to shoppers. All online orders today are either: (1) picked from a warehouse/distribution center or (2) shopped directly from inventory already in a store. Store inventory comes mainly from the store shelf. Some companies use warerooms at the store that hold separate inventory that is 100% dedicated to fulfilling online orders. This is done mainly to protect against running out of key items that are promoted heavily. Once eRetailers determine from where they will source their online inventory, they then must decide which delivery method they will use to fulfill the order. Some will only deploy one option, whereas others may offer multiple delivery options at the same location.

**ACTIVITY-BASED COSTING**

Activity-based costing (ABC) results were derived from data across five local/regional grocery brick and mortar retailers and one regional pure play eRetailer. All of the E-Commerce cost analyses cover a 52-week

period (2013/2014) and represent all departments, categories, and online SKUs. Each temperature state (dry, frozen, chilled) of consumables is covered, and all fixed and random weight (produce, deli, fresh meat, etc.) SKUs are included in the analyses.

Currently, brick and mortar retailers operate primarily seven different E-Commerce models (a combination of inventory location and delivery method). The straight average E-Commerce order across the seven models generates approximately 7.5% profit on a direct basis, assuming the shopper pays the shipping and delivery costs. By comparison, a brick and mortar supermarket generates a true profit of around 12.5% (excluding indirect costs) on regular, non-E-Commerce transactions.

**TABLE 1. AVERAGE E-COMMERCE P&L PER UNIT IN THE GROCERY AND CONSUMER PACKAGED GOODS INDUSTRY**

Average eCommerce P&L per unit sold across seven eCommerce models			The seven eCommerce models include:
Avg. Retail Price	\$3.25		1. Store inventory/van delivery
Cost of Goods	\$2.28		2. Store inventory/in-vehicle pickup
Gross Profit	\$0.98	30.0%	3. Store inventory/in-store pickup
Fees Paid By Shopper	\$0.22		4. Store inventory/parcel
Adj. Gross Profit	\$1.20		5. D.C. Inventory/Van Delivery
Direct ABCs*	\$0.95		6. DC inventory/parcel
True Profit	\$0.24	7.5%	7. Dark store/van delivery

\* Includes direct warehouse, store and eCommerce processes and activities. Excludes eCommerce startup development costs, corporate back office, and overhead costs to manage eCommerce and indirect costs.

Notes: Price is net of all shopper discounts. Cost of goods includes all vendor promotional monies.

Fees includes shopping charges to pick the online order and any van delivery charges.

Parcel does not include third-party costs (e.g., UPS, USPS, FedEx) and assumes the customer pays for this cost.

Source: Willard Richon 2015 eCommerce ABC Standards

Direct costs include all costs to get the product to the picking location (warehouse or store) and the incremental E-Commerce cost to fulfill the online order. This does not include the back-office costs to develop and manage online orders. Back-office costs were excluded from this analysis because many programs are still in their infancy, and it is unfair to burden programs fully with high startup costs, at least until critical mass is reached. Startup costs are often more than \$100,000 per brick and mortar store to launch E-Commerce, and corporate overhead (annual back-office costs) averages around 5% of E-Commerce sales. In the present study, as many as 28 unique processes and activities were used to generate the direct ABCs across the seven programs.

**TABLE 2.AVERAGE E-COMMERCE P&L PER UNIT SOLD (DIRECT COST BASIS) FOR SEVEN FULFILLMENT MODELS**

	Store Inventory Van <u>Delivery</u>	Store Inventory In-vehicle <u>Pickup</u>	Store Inventory In-store <u>Pickup</u>	Store Inventory <u>Parcel</u>	DC Inventory Van <u>Delivery</u>	DC Inventory <u>Parcel</u>	Dark Store Van <u>Delivery</u>	<u>Average</u>
Avg. Retail Price	\$3.25	\$3.25	\$3.25	\$3.25	\$3.25	\$3.25	\$3.25	\$3.25
Cost of Goods	\$2.28	\$2.28	\$2.28	\$2.28	\$2.28	\$2.28	\$2.28	\$2.28
Gross Profit	\$0.98	\$0.98	\$0.98	\$0.98	\$0.98	\$0.98	\$0.98	\$0.98
Fees Paid By Shopper	\$0.20	\$0.11	\$0.20	\$0.50	\$0.13	\$0.25	\$0.18	\$0.22
Adj. Gross Profit	\$1.17	\$1.09	\$1.17	\$1.47	\$1.10	\$1.22	\$1.16	\$1.20
Direct ABCs *	\$1.18	\$0.89	\$0.95	\$1.43	\$0.57	\$0.71	\$0.95	\$0.95
True Profit	-\$0.01	\$0.20	\$0.22	\$0.04	\$0.53	\$0.51	\$0.20	\$0.24
True Margin	-0.2%	6.1%	6.9%	1.1%	16.4%	15.8%	6.3%	7.5%
Fees Used Per Order	\$9.95	\$4.95	\$4.95	\$4.95	\$6.95	\$4.95	\$9.95	
Order Size (units)	50	45	25	10	55	20	55	

\* Includes direct warehouse, store and eCommerce processes and activities. Excludes eCommerce startup development costs, corporate back office and overhead costs to manage eCommerce and indirect costs.

Notes: Fees range across retailers and the most common fee shoppers pay was used for this analysis by type of eCommerce program. DC parcel programs generally do not charge a shopping or delivery fee, however, they have higher prices to make up for not charging a fee. A fee was used in this analysis in lieu of higher prices.

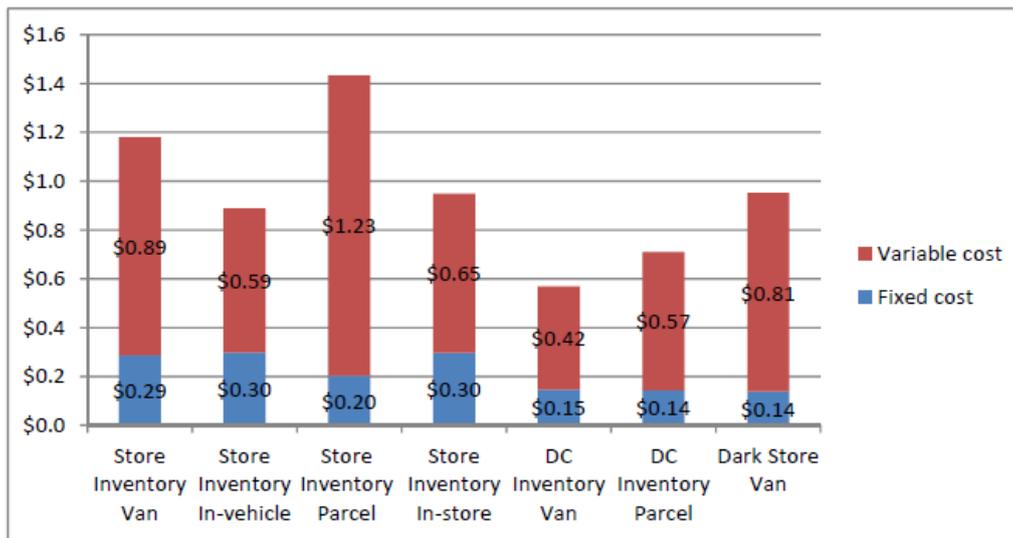
Source: Willard Bishop 2015 eCommerce ABC Standards

The DC van delivery model is the least expensive to operate, because there are no store-level expenses, and orders are fulfilled from one location within a geographic region. Although the last mile can be expensive (all deliveries are out of one location), the DC van delivery model leverages centralized inventory and picking, which significantly limits touch points and offsets the high cost of deliveries. A DC E-Commerce program (with or without van delivery) can support hundreds of stores in high population areas; indeed, population density is key. The main cost drivers between DC models and store models are compared in Table 3:

	Inventory location	Pickers/shoppers	Vehicles
DC model	One inventory location and significantly fewer touch points.	Significantly smaller team with tight pick zones in one location.	One centralized fleet.
Store model	Hundreds of inventory locations (Significant duplication), which results in more orders, more handling, and more equipment; essentially, more everything.	Many shopper teams spread across hundreds of stores. This creates slacker in the system and less productive picking/shopping.	Each store requires a minimum of two to-three vehicles to cover peak periods. This means a significantly larger fleet, excess capacity, and underused cube.

**TABLE 3.COMPARISON OF DC MODEL AND STORE MODEL ON THREE FACTORS**

Although it is more expensive to operate, store models are growing and more popular among brick and mortar retailers because they are easier to startup. Most of the E-Commerce activity based costs eRetailers incur are variable. The model that generates the largest variable costs is the Store Inventory Parcel model.

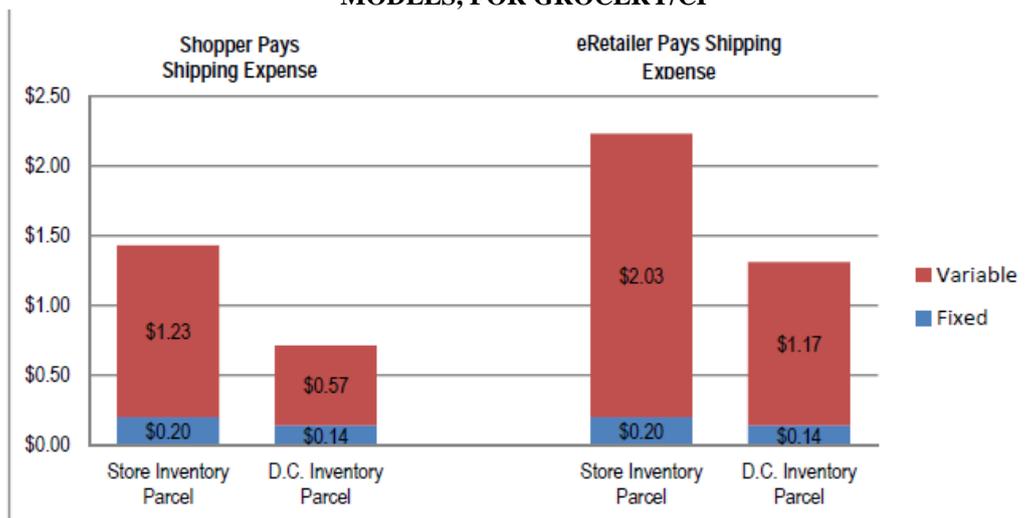


Source: Willard Bishop 2015 eCommerce ABC Standards

**Figure 1. Fixed and variable cost breakouts of E-Commerce models. Parcel models do not include shipping cost.**

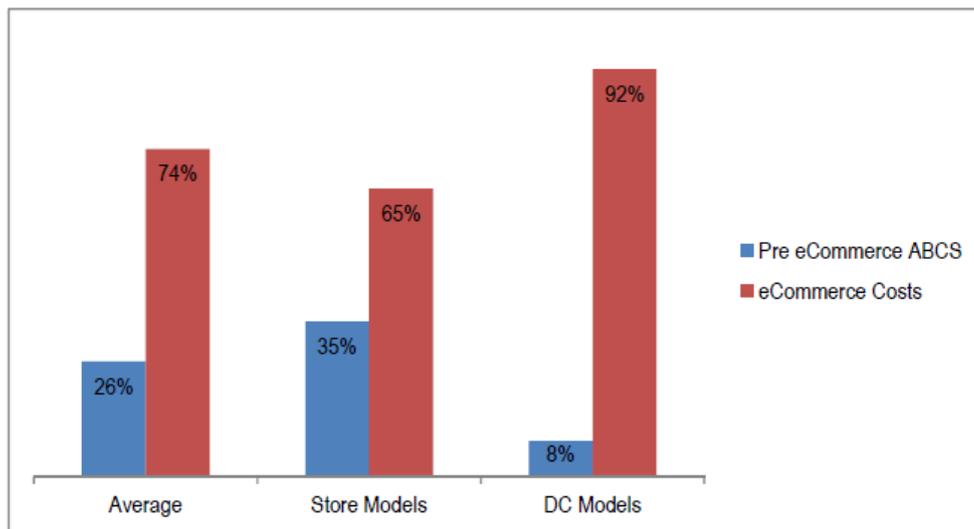
Figure 1 does not include third-party shipping costs (e.g., UPS, USPS, and FedEx) for parcel programs, because it assumes the shopper pays for this expense. For eRetailers that absorb the shipping cost, E-Commerce ABCs increase significantly, by \$0.60 to \$0.80 per unit.

**FIGURE 2. FIXED AND VARIABLE COST BREAKOUTS OF PARCEL DELIVERY E-COMMERCE MODELS, FOR GROCERY/CP**



Source: Willard Bishop 2015 eCommerce ABC Standards

The direct ABCs for E-Commerce programs include existing warehouse and store (pre-E-Commerce) costs and incremental E-Commerce costs. On average, nearly three-quarters (74%) of E-Commerce costs are incremental and one-quarter (26%) represent the pre-order costs to move product through the system before the E-Commerce order is placed.



Source: Willard Bishop 2015 eCommerce ABC Standards

**FIGURE 3. WHERE COSTS BUILD UP: PRE-E-COMMERCE AND E-COMMERCE COST BREAKOUTS OF E-COMMERCE MODELS, FOR GROCERY/CPG**

A higher share of store model costs are generated by pre-activities compared to the DC E-Commerce models. Before a store picks an online order, the retailer incurs the cost to get product to the shelf. This usually means covering 100% of the warehouse costs (where applicable) and a majority of the normal brick and mortar store costs. This includes ordering, receiving, putting away, selecting and loading, moving, stocking, rotating, facing, occupancy, and so on.

**TESTED CASE AND RESULT ON SUPPLY CHAIN INNOVATIONS COSTS**

As part of the present research, we also constructed a detailed computer simulation model of the entire E-Commerce process for some of the delivery models. In these simulation models, we generate streams of orders for different items using demand distribution information from the ABC cost model. Each order in this stream of orders is a different size and consists of different items. The simulation then mimics the entire order fulfillment process for the delivery model being tested, adding up all the costs along the way. The cost for each order is recorded, and averaged over the entire stream of orders. These averages are then used to study the system’s performance.

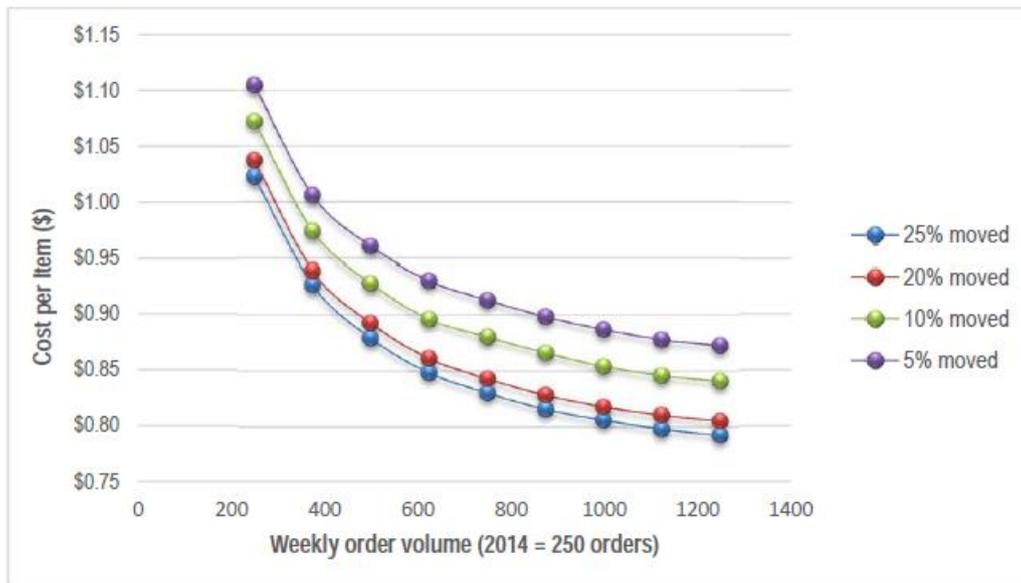
Because the computer simulation model mimics every activity in detail, it allows us to test the effect of modifying some of those activities. This, in turn, provides us with a test bed to understand the cost and service-level implications of changing the structure of some of these E-Commerce delivery models. We provide the results of three such test cases/supply chain innovations in the following paragraphs. Note that these are only results from the computer simulation and not from an actual field test. Given the level of detailed information, however, from the micro ABC model that we use in our simulations, and extensive testing, we are confident that these provide reasonable projections for the cases tested.

**Test case: Van delivery with store pick, moving some inventory to wareroom**

It is well-known that the distribution of volume by SKU is very asymmetric; that is, a small number of SKUs have a very high volume, whereas a large number of SKUs have a very low volume. Another observation from our micro ABC cost model is that the unit cost for picking a single item for an order is significantly different depending on whether inventory is picked from a store or from a DC, for obvious reasons. Specifically, picking from store shelves costs \$0.26 per unit, but picking from a DC shelf costs \$0.035 per unit.

This suggests the value of an idea that has been circulating in the industry: the concept of a wareroom. Suppose the retailer moves the top say 10% of SKUs to a separate inventory room, where shoppers are not allowed. This wareroom is specially designed for fast picking of E-Commerce orders. When an E-Commerce order arrives, SKUs that are available in the wareroom are filled quickly and cheaply from there, after which the worker picks the remaining items from store shelves.

Using our computer simulation model and precise data from the ABC model that provides the distribution of SKU volumes, we can estimate the costs of implementing a wareroom by moving various percentages of the inventory to the wareroom.



**FIGURE 4: ESTIMATED UNIT COST FOR VAN DELIVERY FROM STORE MODEL.**

As Figure 4 shows, even at current volumes (250 orders per week on average for 2014), moving 5% of the top moving SKUs to the wareroom results in a unit cost of \$1.10, compared to the \$1.18 reported in Table 2. If the top 20% of SKUs are moved (at 2014 volumes), unit cost decreases to \$1.04, representing a 4.3% improvement in profit. If we combine moving 20% of the top SKUs with a doubling in volume (at a 15% growth rate, volume is expected to double by 2019), the unit cost of fulfillment decreases to \$0.89. This represents a \$0.29 improvement compared to the baseline from Table 2 and thus changes the true margin from -0.2% to 8.6%. Note that the true margin would have improved to 4.0% with the volume increase alone as such, the wareroom provides an additional 4.6% improvement in profit. Note that this is only an approximation. True picking costs from a wareroom may be slightly more or slightly less than picking costs from a DC depending on the equipment. In addition, our analysis does not include the cost of installing the equipment. However, our analysis provides evidence of the potential to reduce costs by deploying warerooms.

#### IV. Conclusion

In order to have an efficient supply chain management e-commerce models of agency to agency are effective. There are useful tools for data transfer of products and services between customers and suppliers such as internet, web and electronic data transfer. Most companies have little knowledge and skills about E-Commerce. The real reason is the lack of understanding e-commerce and lack of adequate knowledge on investment in this type of business. Governmental support is required for execution and benefiting from E-Commerce and finding internet services and web-site development. Right now there are a lot of problems facing e-commerce, some of which are internet speed, lack of governmental support, management of customer relations, safety and behavioral parts which should be considered at the time of execution on agency to agency basis. Some supply chain innovations, such as moving fast-moving items to a wareroom if store fulfillment is used, or using larger vehicles to complete more deliveries per trip, offer greater opportunities for cost savings. For example, combining both the wareroom with larger vehicles and assuming a doubling in volume over 5 years, the van delivery from the store model advances from being marginally unprofitable to a profit margin of approximately 11% to 15%.

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