

The Impact of Bullwhip Effect in e-Business on the Automotive Industry (Case Study: Saipa)

Majid Mehrad and Hasan Akbari*

¹Department of Industrial Engineering, College of Industrial Engineering, Naragh Branch, Islamic Azad University, Naragh, Islamic Republic of Iran

²Department of Industrial Engineering, College of Industrial Engineering, Delijan Branch, Islamic Azad University, Delijan, Islamic Republic of Iran

Abstract

Supply chain, the set of institutions and organizations referred to in the design of new products and services, raw materials, semi-manufactured goods, and made them into (final) and to contribute to the final customer. The chain has a simple look of the members, including customers, retailers, wholesalers/distributors, manufacturers and suppliers of raw materials and pieces. Chain members through three main streams of information, physical (product) and monetary (and fiscal cash) linked together. These trends among Members are bidirectional. Efficient management and effectiveness of the flow between all stakeholders in all stages (including product design, forecasting and planning, procurement and purchasing of raw materials, production and distribution, after-sales service and final consumption products) and aims to maximize total value chain and supply chain management to say. The uncertainty surrounding the various components of the supply chain and demand chain length has caused variability and the distance from the end customer and actual demand, more fluctuation in the value of the order is created, which can cause adverse effects, this phenomenon is called the bullwhip effect. Several factors are involved in this issue that strategies to deal with them listed. Effective in reducing the impact on the automotive industry is with regard to e-Business capabilities. And its role in the fight against this phenomenon is the subject of this article who will try to review.

Keywords: e-Business, Supply Chain, Supply Chain Management, The Bullwhip Effect

1. Purpose of Research

E-Business models, a description of the roles and relationships among customers, consumers, partners and suppliers looking for determining the flow of product, information and money and identify the major benefits for shareholders and participants are in business. The new model uses the Internet to conduct business transactions and create value for customers and other stakeholders to act. The E-business looking digital value chain and business processes and seek to create new value for organizations and achieve operational excellence, financial and organizational requirements. Semantic E-Business which includes all aspects of the use of information technology in business includes not only the purchase and sale includes integration of business processes and

communication within and outside the organization. Step beyond businesses, a concept called dynamic e-business. How to create dynamic businesses and looking for an integration of the system in three dimensions, intranets, extranets and the Internet in a dynamic state. Dynamic E-business organizations faster and easier to modify existing systems when business processes need to be changed and through the use of Internet standards and leverage the benefits of public infrastructure, following the creation of computer networks within and outside the organization's performance. On the other hand, if there are inefficiencies in supply chain management, increases from low to high variability in the chain. . The smallest changes in customer demand can lead to very large changes in the application located on the top and eventually causes severe fluctuations in the entire chain.

*Author for correspondence

Small changes in demand in the downstream (customer) which resulted in a strengthening of demand and a huge increase in inventory levels and changes in the level of the chain are called the bullwhip effect. This effect occurs when the level of variability of the order, more than the actual demand variability. Open this result in the diversion of the chain becomes more intense. Typically, the higher the degree of deviation will be greater and greater amplitude. There is such a demand will lead to chain efficiency. The bullwhip effect can be through signs such as overstocking, excessive or insufficient capacity, inadequate due to the lack of customer service or lack of preparation and lack of efficiency at the retail level, the accumulation of semi-manufactured goods, production planning shaken, high cost of ordering, warehousing, transportation and manpower finally, there is inconsistency and uncertainty among members of the supply chain can be observed.

2. A review of Studies

All stages of the supply chain that are directly or indirectly involved in the realization of customer requests, including the main objective of its management, providing customers with access to the maximum value. The chain requires coordination and collaboration among all members is a strategy to maximize the integrity of the product, cannot handle the demand. One of the main objectives of supply chain management, change control and minimize variability in the chain. Because any small change at the beginning of the chain (the final customers) can cause large changes in the chain (suppliers of raw materials) is the result of which would impose additional costs on the whole. Efficient and effective management of the flow between all stakeholders in all stages (including product design, raw material procurement and purchasing, forecasting and planning, production and distribution, after-sales service and final consumption products) and aims to maximize the value of the whole supply chain management say. Chopra and Meindel¹ supply chain consists of three basic components of customer service management (Management Company with customer facing processes). Internal supply chain management (management of all internal processes) and manage relationships with suppliers know. Taking advantage of the model with respect to the management of relationships with suppliers systematic relationships between components, the combined uncertainty, variability and further

reduced, and the possibility of a strategic partnership between the components is provided. Thus the conditions minimize its negative effects and lashes². The first studies on the bullwhip effect, conducted by Forrester. The root cause of fluctuations in demand and lack of transparency, customer demand, and inventory levels are known to distort information and inconsistent regulation that affect the delay in delivery is worse. Solutions proposed to reduce this effect, reduce unnecessary layer decreased to goods chain and the exchange of information. After numerous investigations, the concepts associated with the bullwhip effect in supply chain and its causes, studied, which include the references cited. The bullwhip effect phenomenon is more renowned for work in the area of inventory management is done by Sterman. Sterman his observations of the bullwhip effect is called "playing the beverage distribution", the report said. The results showed that in a multi-level supply chain that decision without consulting any of the other decision-makers are required orders received increased by moving variance in the supply chain and increase from the bottom to the top of the chain to be exacerbated. Trade and business methods, one of the most important areas that the adoption of information and communication technologies and the Internet quickly and was extremely impressed. Many of the techniques and methods have revolutionized the traditional revenue and frequency values also came into existence. The business model is a method of doing business in a way by which the company can retain its and to guarantee their survival, in other words, the income generated. In general we can say that E-Business is the use of all information systems to enhance business processes and controls. Today, these processes are developed using web-based technologies Businesses have five main tool is the following components:

2.1 Customer Relationship Management (CRM)

This component seeks to establish relationships with customers the registration records of orders and transactions with the organization and create customer loyalty.

2.2 Supply Chain Management (SCM)

This component seeks to manage the flow of material, financial and information flows between the organization and its business partners are set. It aims to achieve

maximum value for the entire chain and in all stages of product design, procurement and purchasing of raw materials, planning and forecasting, production and distribution, after-sales service and final consumer product.

2.3 Business Intelligence (BI)

This structure and systematic approach to collecting and analyzing data collection activities in the market and our competitors is which resulted in benchmarking the best practices of other companies are competing.

2.4 E-Commerce

This component seeks unity in the purchase and sale transactions and sales activities and on the other hand, the purchase of the security issues that lead to trust them.

2.5 Enterprise Resource Planning

Looking for integrity in the purchase and sale and personalized service to all internal and external resources in order to reduce the cost. This is part of a comprehensive information system that can be changed and adjusted based computer with the help of a database that allows the integration of all processes, departments, information and resources with the objective of effective management of resources, instant access to information in the field and provides various sectors. The ultimate goal of this component is that the information entered into the system only once. There are five different instruments together creates a major advantage in the supply chain the end result is a set of benefits, the peak integrity and stability and predictability in the chain, effective management and control of the value chain. In previous studies, a study entitled "electronic purchasing and supply chain performance" by conducted to examine the relationship between electronic purchasing and supply chain performance. Two interviews with practicing managers and experimental study was conducted in this study. A study entitled "the bullwhip effect" service by conducted to examine how the bullwhip effect in the rise of the service sector and what policies should be adopted to resolve them. Analytical methods used in this study, is a combination of deductive analysis and data analysis of the supply chain of the telecommunications industry. Using quantitative and qualitative research concluded that management practices are causing the bullwhip effect. In a study titled "Supply Chain Coordination with product design" by conducted

the purpose of this paper is to assess alignment between product design and supply chain and identify how these adjustments in response to the supply chain of a company is its flexibility. Another study entitled "innovative supply chain practices" by is this study has been innovation in supply chain management. Most innovations in supply chain relationships and, in particular, have been studied from the point of view of product.

2.5.1 Hypotheses

To investigate this issue, the following assumptions have been considered:

- E-business can reduce the bullwhip effect at all stages of the supply chain.
- E-business supply chain has a positive effect on increasing the performance of mainstream information.
- E-business supply chain does not affect the performance of mainstream physics.
- E-business supply chain has a positive effect on increasing the performance of mainstream money.
- E-business can reduce demand changes in the supply chain have followed.

The research questions addressed in this study is as follows for testing hypothesis is stated:

- Does E-business can reduce the bullwhip effect at all stages of the supply chain?
- Does E-business supply chain have a positive effect on increasing the performance of mainstream information?
- Do E-business supply chain does not affect the performance of mainstream physics?
- Does E-business supply chain have a positive effect on increasing the performance of mainstream money?
- Does E-business can reduce demand changes in the supply chain is looking for?

3. Methods

The method of research and development applications where field. The purpose of this study was to evaluate the impact of the bullwhip effect in the automotive E-Business is to investigate the hypothesis that the population studied 25 members of the automotive supply chain company Saipa are selected. They are different ways to calculate the sample size to afford one of these techniques, the method is Morgan. In cases where the variance of the population or the percentage required is not available, you can use this table to estimate the sample size.

The volume of each sample using the Morgan with a population of 25 to 24 is who were selected randomly. This table shows the maximum number of samples. The data collected by a questionnaire based on Likert scale organized in which 20 questions are intended as a response never, rarely, sometimes, often and always has been in the order of 1 to 5 points. To confirm the validity of the questionnaire was placed in the hands of professionals after revisions, the validity was confirmed. To evaluate the reliability of the questionnaire, Cronbach's alpha was used to test the calculations were made based on the information obtained, since that amount was greater than 0.7, the reliability of the questionnaire was confirmed.

4. Results

The questionnaire consisted of 25 questions, each of these questions consists of 5 items from the questionnaire are shown in Table 1.

Table 1. Number of items allocated to each of the questions of the questionnaire

No.	The Research Questions were Brief Titles	Number Assignment Questions in the Questionnaire
1	The impact of e-business can reduce the bullwhip effect at all stages of the supply chain	1-5
2	The impact of E-business on the performance of supply chain information	5-10
3	The lack of impact of E-business on supply chain performance mainstream physical	11-15
4	The impact of E-business on supply chain performance mainstream monetary	16-20
5	The impact of E-business can reduce demand changes in the supply chain	21-25

Table 2. Distribution of respondents to the research questions

Floors	The Percentage of Research Questions				
	Question One	Question Two	Question Three	Question Four	Question Five
Never	11.23	8.93	32.23	11.23	9.54
Rarely	19.93	20.76	21.98	19.93	21.5
Sometimes	34.78	30.68	15.63	34.78	33.42
Often	23.65	28.4	17.78	23.65	23.34
A lot	10.41	11.23	12.38	10.41	12.2

Frequency questionnaire respondents to the questionnaire according to Table three, which can be descriptive results are presented for each of the four questions.

For example, the descriptive results of the first research question can be described as follows:

Do e-business can reduce the bullwhip effect at all stages of the supply chain?

11.23% of the respondents the extent to never, rarely, 19.93 percent, 34.78 percent, in some cases, 23.65 percent and 10.41 percent are considered high. According to Table 3, for the remainder of the current research questions can be expressed as descriptive results.

4.1 Statistical Hypothesis

Statistical hypothesis testing is used to examine the hypotheses.

It is noteworthy that according to the statistics of the sample mean and sample size $n = 24$, the following terms of distribution t (Student distribution) will follow.

Critical area or region H_0 hypothesis is as follows: Given the sample size of 24 to 23 degrees of freedom and our alpha set at 0.05.

$$\text{If } n < 30 \quad t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}}$$

$$t \geq t_{1-\frac{\alpha}{2}} \quad \text{and} \quad t \leq t_{\frac{\alpha}{2}}$$

$$t \geq 2.069 \quad \text{and} \quad t \leq -2.069$$

Table 3. Results of t-tests for each of the Hypotheses

Hypothesis	n : Number of samples	$\bar{x}$: Average	S standard error	t-statistic
1	24	2.65	1.12	-1.53
2	24	3.56	1.55	1.769
3	24	3.71	1.347	2.582
4	24	2.95	1.11	-0.22
5	24	2.85	1.23	-0.59

The results can be reviewed by four research hypotheses payment:

4.1.1 Hypothesis One

E-business can reduce the bullwhip effect at all stages of the supply chain.

For a given hypothesis t - test in accordance with the results in Table 3 have been calculated value is -1.53.

Given the critical zone $\alpha = 0.05$, $t \geq t_{1-\frac{\alpha}{2}} = 2.069$

$$t \leq t_{\frac{\alpha}{2}} = -2.069$$

the calculated value is not in the critical region. As a result, the impact of E-Business premises may be approved to reduce the bullwhip effect.

4.1.2 Hypothesis Two

E-business information supply chain has a positive effect on increasing the performance of the mainstream.

Due to the assumption of the t - test and according to the results in Table 3 have been calculated value is 1.76.

Value is calculated with the critical areas in the region

is not critical. Consequently, the hypothesis is also supported. E-business can reduce demand changes in the supply chain have followed.

4.1.3 Hypothesis Three

E-business supply chain does not affect the performance of mainstream physics.

For hypothesis three with respect to t - test in accordance with the results in Table 3 have been calculated value is

2.58 given the critical region $\alpha = 0.05$ and

$$t \geq t_{1-\frac{\alpha}{2}} = 2.069 \quad t \leq t_{\frac{\alpha}{2}} = -2.069$$

the statistic is calculated in the critical region. The lack of impact of E-business effects on supply chain performance rejected by the mainstream physics.

4.1.4 Hypothesis Four

E-business information supply chain has a positive effect on increasing the performance of the mainstream.

Due to the assumption of the t-test and according to the results in Table 3 have been calculated value is -0.22.

Value is calculated with the critical areas in the region is not critical.

As a result, four hypotheses are also supported.

4.1.4 Hypothesis Five

E-business can reduce demand changes in the supply chain have followed.

For the fifth hypothesis with respect to t-test in accordance with the results in Table 3 have been calculated value is -0.59.

Value is calculated with the critical areas in the region is not critical. As a result, the fifth hypothesis is also supported.

The results obtained are characterized electronic work flow automation, call 24 hours a day and Annie in the chain, constant communication with customers through customer relationship management tools, and detailed market survey by business intelligence tools do,

can always be identified based on customer demands immediate orders to their product offerings. Additionally, streamline and enhance the quality of internal and external information flows and integration with enterprise resource planning tool to easily and their demands will be instantly sent to suppliers with minimum time delay may be, material to be available in time and place. Despite the continuous and consistent throughout the network of any changes in every part of the chain can be transmitted quickly to other parts or the slightest error in the decision, the decision to perform the appropriate actions will be taken. Overall, it can be necessary to reduce the effect of the major advantages of E-Business look. E-business tool set and its components can influence the likelihood of the emergence of the whip a phenomenon observed in the distribution channels based on the forecast, reduce the time and provide accurate information and immediate communication with the entire chain, minimum create volatility in the chain. At least variability in currents chain flexibility chain processes, flexibility to changes in customer requirements, process redesign buy, match the size of the assigned and the order of categories and distribution channels and price adjustments are the result of a single approach to the final customer. Having the flexibility of integration activities in the chain length increases the likelihood of emergence of these negative effects will be reduced. Through this integration, which should be internal (ie integrity of the internal processes of the company) and the external dimension (i.e., the integrity of the chain length and between members) are created by the system can be added to the chain business. The E-Business also creates a negative impact on the bullwhip effect in supply chain behavior have this hypothesis is accepted. Although the businesses are structured and purposeful increase in demand and the integration of the supply chain more and thus to reduce volatility, the bullwhip effect will decrease the likelihood of emergence of the phenomenon.

4.1.5.1 Suggestion

According to data obtained in the research findings are suggested:

1. The demand forecast based on customer requirements.
 2. Reducing the time of order to delivery.
 3. In order to share data, sales, capacity, inventory and other Materials.
 4. Determine the exact delivery time and understand the pattern of demand for the product in the supply chain.
 5. A detailed and updated information supply chain process.
 6. Decreasing the time the orders to deliver them.
 7. Inappropriate anticipated requirements and deficiencies.
 8. Reduce volatility and changes in prices.
 9. Reduce inappropriate and unplanned purchases.
 10. Reduce variable costs of transport.
 11. The proper use of policy-based storage precaution.
- Suggestions for Future Research.
 - Review of current research in other industrial and manufacturing companies.
 - Examine the role of financial factors in the bullwhip effect in supply chain.
 - The effect of anticipation, waiting for orders and information flow of the whip.
 - The effects of policies and procedures in order to predict the severity of the bullwhip effect.
 - Effect of information sharing and delivery of order and balance in the hands of the whip.

5. References

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