

Trust based decisions in supply chains with an agent



Xiao Fu ^a, Ming Dong ^{a,*}, Shaoxuan Liu ^a, Guanghua Han ^b

^a Antai College of Economics & Management, Shanghai Jiao Tong University, Shanghai 200030, PR China

^b School of International and Public Affairs, Shanghai Jiao Tong University, Shanghai 200030, PR China

ARTICLE INFO

Article history:

Received 24 October 2013

Received in revised form 18 November 2015

Accepted 18 November 2015

Available online 4 December 2015

Keywords:

Information sharing

Trust update

Simulation

Agent

ABSTRACT

In this paper, we propose a quantitative method to study the trust relationship between a retailer (he) and an agent (she) in the supply chain. The retailer seeks private demand forecast information from the agent before procuring the optimal order quantity (OOQ) of a product from a supplier. To earn more profit, the agent has an incentive to inflate her forecast. However, the decisions of the agent has impact on her immediate gains as well as her future credibility as the retailer updates his trust in the agent at the end of each demand period. We study how the repeated interaction and updated trust influence decisions of the retailer and the agent and their impacts on the supply chain performance. We also investigate how social characteristics of the agent affect the decisions and supply chain performances. In particular, we consider two types of agents: a benevolent agent who seeks to maximize the retailer's profit and a selfish agent who cares only her own profit. The simulation results and analyses of this paper show, that trust updating model effectively embodies the idea of punishment for opportunism and maliciously recommended behavior which are brought about under the influence of the selfish commission agent; that trust value will decline rapidly when consecutive trading failure occurs or the commission agent begins to have opportunistic behavior, i.e. the retailer's predicted demand is more accurate than commission agent's; and that to restore trust value has to undergo a lengthy process which will take commission agent a long time and greater effort to earn trust back.

© 2015 Elsevier B.V. All rights reserved.

1. Introduction

Solectron used to be one of the biggest electronics contract manufacturers in the world. In 2000, company officials said that they were concerned about overcapacity in telecom equipment. However, their big customers such as Cisco, Ericsson and Lucent, were very optimistic and predicted rapid increase in wireless phones and networking gear market. Despite Selectron's concerns, big telecom companies pushed Solectron and other contractors to build up capacities and produce more products. And they promised to pay for the excess material. But when the order dropped, it was too late for Solectron to stop orders from its 4000 suppliers, which finally caused a \$4.7 billion write-off in inventory. This case shows that distrust between corporations in the upstream and downstream of a supply chain can result in increase of inventory and decrease of profits.

When entering a new market, many companies rely on local agents to gather market information, as local agents possess better demand information than the retailer because of their local connections. For instance, BMW commissioned its sale of cars in China to South Industries Motors, a local company in southern China. BMW obtained knowledge of Chinese consumers' tastes, market size and demand

information through the agent. The agent not only helped BMW sell its products and facilitates the establishment of reputation of its products, but also laid the foundation for BMW to build factories to manufacture cars, which not only reduced the cost and risk but also obtained great benefits. In addition, many corporations of international wine brands sell their products through the one-agent and several-retailers model. These cases show that the agents play a crucial role in the trust of the supply chain. The trust issue exists in those decision processes. Similarly, in a field study of a major automotive manufacturer [10] they found that the dealer and the salesperson (who serves as the agent) were willing to share their forecasts of demand even if formal contract about information sharing did not exist. In addition, almost all of the salespersons they interviewed indicated that the key to success was a trusting and mutually beneficial relationship with the dealers. In this paper, we specifically examine the roles of trust, length of relationship, and demand forecast accuracy of the agent and the retailer in the information sharing mechanism.

Information asymmetry is common in supply chain because the information holder has the intention to share unreal information to maximize his (her) profit. Thus, the information receiver may distrust the received information. Therefore, trust has been recently introduced into the supply chain information sharing process to mitigate the information receivers' potential loss. Trust has also been proven to be helpful for supply chain cooperation [19]. Trust reflects the enterprise's reliability, integrity, and ability to dynamically change over time based

* Corresponding author.

E-mail address: mdong@sjtu.edu.cn (M. Dong).

on transaction history. Trust varies in a wide range of levels from a full trust to a complete distrust. A trust value can represent these levels.

This paper studies the effectiveness of trust in a three-tier supply chain. The agent (she) forecasts the market demand and recommends an order quantity to the retailer. At the same time, the retailer (he) also makes the market forecasting. Once the retailer receives the agent's recommended order quantity (ROQ), he has to decide to what degree he should trust the agent then he updates his forecasting about the market demand combing both the agent's and his own forecast by using a trust model (we will introduce the trust model in Section 3) and places an order. The manufacturer produces and delivers the product quantities according to the retailer's orders. Because the agent's profit is positively affected by the retailer's order quantity, she may overstate the demand forecast.

In practice, trust is accumulated gradually based on past experiences. Therefore, in this paper, we study the information sharing process with trust in multi-periods. To model the dynamic of the retailer's attitudes towards the agent's trustworthiness, the retailer's trust level of the agent is assumed to change over periods based on historical transactions, and the agent must make her decisions of ROQ taking into account retailer's trust level. The optimal ROQ in each period is thereby calculated. We find that our proposed trust updating model can motivate the agent to make better decisions and improve the whole supply chain's performance.

The contributions of the paper are twofold. First, a trust updating model is proposed to formulate the retailer's trust changing process across different transaction periods. In the extant literature, trust was often considered a constant [7,18] that never changed over periods. However, trust is usually adjusted according to the information sender's past actions. Trust can also be affected by the information accuracy when the information receiver obtains information from multiple sources. Thus, the proposed trust model also takes this fact into consideration. Second, in our paper the level of trust is quantified and studied under a multi-period model wherein three parties (i.e., a supplier, a retailer and an agent) share information. Since the multi-period information sharing problem seldom considers the trust issue, this paper explores the evolution of trust and its impacts on the information sharing and decisions of different parties in a supply chain. Some managerial insights are derived based on our model analysis and extensive simulation studies.

The rest of the paper is organized as follows: in Section 2, we review the related literature; in Section 3, we formulate the multi period trust updating model; in Sections 4 and 5, we design the experiment and run many simulations. Then the simulation results are analyzed. In the last section, we conclude the paper as well as consider any future work.

2. Literature review

This paper studies the demand information sharing problem in a three-tier supply chain. A trust model is proposed to model the evolution of the retailer's trust levels about the agent. Due to information asymmetry, the agent has intention to report unreal information to maximize her own profit [6]. The multi-period trust updating model is very critical and enables the retailer to adjust his trust level about the agent and reduce risk. From as early as 1990s there were scholars who conducted research on the concept of trust between enterprises. For example, Doney and Cannon [21], Carney [2], and Morgan and Hunt [16] used game theory, methods of transaction costs, principal-agent method, and etc., to study the dynamic trust between enterprises in the supply chain. Selnes [24] used credit standing theory which holds that trust always has something to do with past behavior or events, and that the good credit standing of the seller will enhance the buyer's trust. Ganesan [9] claimed that the good credit standing of the seller is based on the reliability and consistency of past behavior. Johnson and Houston [14] believed that the supplier that has good credit has the motive to fulfill honest and consistent behavior in the market. Moreover, trust is not only associated with corporate goodwill but is also closely related to other factors of the transaction object [12]. The previous research studied what factors affect trust, our paper differs from this stream of literature as we focus on examining how the evolution of trust affects the decisions of different players in a supply chain and their performances.

Although most of previous research in operations management on trust has been empirical work, analytical research on trust has received attention in operations management area. There is a growing body of work that studies supply chain trust issues using both modeling and simulation methods. Taylor and Plambeck [26] developed a model in which a buyer and a supplier had an informal agreement on required capacity. They concluded that the buyer would honor such an agreement because of the future value of cooperation. Ren et al. [23]

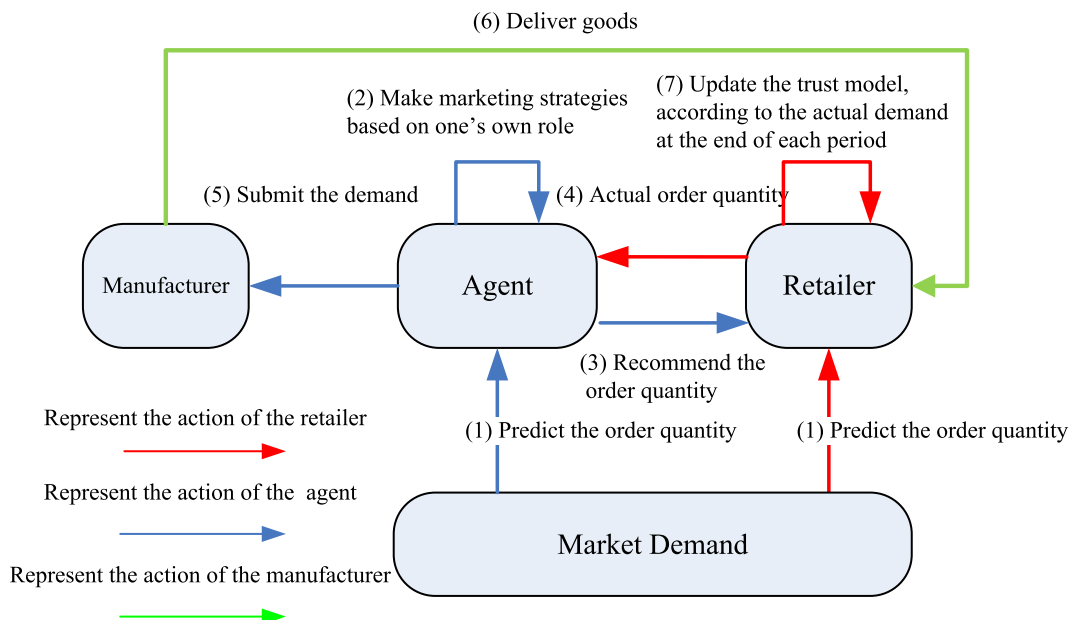


Fig. 1. The operation framework of the three-tier supply chain.

Download English Version:

<https://daneshyari.com/en/article/554653>

Download Persian Version:

<https://daneshyari.com/article/554653>

[Daneshyari.com](https://daneshyari.com)