A Case Study of Integrating Knowledge Management into the Supply Chain Management Process

Nancy C. Shaw  
George Mason University  
School of Management  
Enterprise Hall, MSN 5F4  
Fairfax, VA 22030-4444  
nshaw@gmu.edu

Mary J. Meixell  
George Mason University  
School of Management  
Enterprise Hall, MSN 5F4  
Fairfax, VA 22030-4444  
mmeixell@gmu.edu

Francis D. Tuggle  
Chapman University  
Argyros School of Business and Economics  
Orange, CA 92866  
tuggle@chapman.edu

Abstract

To achieve success at supply chain management (SCM), an organization must possess--and share--knowledge about the different facets of the supply chain. Lack of information sharing between members of the supply chain has been shown to significantly affect total profitability. As such, we argue that Knowledge Management (KM) can enhance the degree of success of existing SCM efforts as well as increase the likelihood of success of new SCM undertakings. While many SCM projects have resulted in improved performance, we believe that additional improvement in performance is possible by coupling KM initiatives with SCM programs. We present a case study of the service parts department of a large automotive dealer that examines the effect of manufacturers' trade promotions on the coordination of decisions in the supply chain. The use of KM to enhance the ordering process for service parts is explored in this paper.

1. Introduction and Background

This study focuses on the prospective use of a knowledge management system (KMS) in a dealer’s ordering decision for automotive service parts, and the resultant effects on overall supply chain performance. The ordering decision is heavily influenced by the basic tradeoffs between fixed and variable ordering costs, as well as the trade promotions offered by original equipment manufacturers (OEM). Recent analyses of electronic channels and interfirm relationships have shown that additional performance gains can be obtained through the exploitation of expertise and knowledge [7]. In this case study we attempt to understand the effects of information technology and knowledge as an asset in our analysis of a focal organization in the automotive supply chain.

Supply Chain Management (SCM) is an approach to coordinating the functions and processes associated with the order fulfillment cycle, with the objective of delivering what the final customer wants at the time and place the customer desires it, in a manner that minimizes total costs for the organizations linked together in the chain. A supply chain can include a number of functional areas within a firm—such as production, distribution and marketing as well as other firms in the supply chain—such as suppliers, transportation carriers, warehouses, retailers, and the end customers themselves [6]. From a process viewpoint, SCM coordinates decisions that involve order management; production and inventory management; materials management; distribution and transportation; and product design.

The major attributes of supply chain performance are cost (inventory, expedited transportation, and capacity in terms of plant, property, and equipment) and customer responsiveness (reliability, flexibility, lead time), as discussed in the Supply-Chain Operations Reference model [31]. These same attributes apply for the automotive dealership. To remain competitive, the dealer needs to provide competent service that is reasonably priced, but expeditious to the customer. It is impractical to keep all parts in stock to meet all potential demand, however, so stock parts must be selected during the ordering process to maximize off-the-shelf availability while minimizing the inventory and ordering related costs.

Knowledge Management (KM) is concerned with the creation, storage, dissemination, and application of organizational knowledge. Knowledge is usually defined [12] as information in context, or actionable information. Successful KM rests upon an organization possessing a supportive culture characterized by high trust and the ready sharing of needed information [12, 32], sufficient technological sophistication [38], and appropriate attitudes and motivation towards organizational success [29].

To achieve success at SCM, an organization must possess--and share--knowledge about many different facets of this process. The knowledge sources are both internal to the organization (e.g., knowledge of the whereabouts of subassemblies, knowledge of sources of manufacturing delays) and external to the organization (e.g., knowledge of the final customer's expectations, knowledge of where
en-route components are and when they are expected to arrive at their destinations.

Lack of knowledge sharing between members of the supply chain has been shown to significantly affect overall performance [1, 3, 4]. As such, we argue that KM can enhance the degree of success of existing SCM efforts as well as increase the likelihood of success of new SCM undertakings. While many SCM projects have resulted in improved performance [2, 5, 24], we believe that higher levels of performance improvement are possible by coupling KM initiatives with SCM programs.

This study extends the concepts in the supply chain and knowledge management literature on the impact of knowledge management on supply chain performance. This study also addresses the impact of trade promotions on supply chain performance and, as such, this study contributes to that field by proposing a model of the use of KM in inventory management and trade promotions.

2. Literature

2.1 Supply Chain Management & Service Parts Management

The basic science of inventory management for a single decision site is based on the economic order quantity, striking the right balance between costs of ordering and holding inventory. These models may also consider price discounts that are available by ordering in larger quantities. When demand for service parts is uncertain, probabilistic models can be deployed to incorporate the cost of stockouts by allowing for additional inventory to increase the service level [21, 35]. Extensions to the models address issues in after-sales service logistics [8, 9, 13, 18] as well as maintenance inventories for equipment in the field [17, 19, 25, 28, 33].

The objective of these single site systems is typically to minimize total costs subject to customer service level – an objective that can readily be extended to multi-tier distribution systems. In a multi-tier context, the base stock control system is often advocated, which considers costs throughout the distribution system [14, 35]. There is less inventory redundancy in a base stock control system and so overall costs are reduced. A number of supply chain management initiatives involve deploying a base stock control system along a supply chain [22, 36]. Other supply chain projects address the design of the logistics network such that both cost and service levels are improved by allowing for sharing of inventory across sites [10, 23].

Another supply chain strategy that involves the ordering decision is Collaborative Planning, Forecasting and Replenishment (CPFR). These systems have emerged as a viable coordination model for distribution supply chains, especially in the consumer goods supply chains. CPFR is a collaboration initiative between retailers and their suppliers, based on the concept that sharing demand information between tiers in the supply chain improves overall performance in terms of in-stock rates, inventory, and sales. The literature concerning CPFR both describes the process used by practitioners in pursuing these projects [34, 39], as well as modeling issues associated with CPFR enhanced supply chains (e.g. [30, 37]).

In this paper, we investigate an automotive service parts supply problem. One strategy particular to the automotive industry pertains to Saturn [11]. Under this strategy, the dealers strive to provide a high level of off-the-shelf availability, but do so with an inventory constraint. Saturn’s approach is a vendor managed inventory strategy, which hinges on the company’s ability to recognize the criticality of various customer needs. Channel partners participate in the Saturn case through a scheme that involves pooling inventory at multiple dealer locations that is readily shared as needed by any of the dealer service departments. One aspect of this decision problem is the dispersion of parts - where the service criticality for a particular part is low; the service part is centralized at fewer dealer locations. Conversely, for parts with high service criticality, the service parts are distributed to more locations, and thus decentralized. However, as will be seen, the Chevrolet and Chrysler brands take a radically different approach to service parts distribution.

2.2 Knowledge Management

The study of KM includes a variety of viewpoints and approaches. For example, the recent literature reflects several different perspectives on KM: a categorization of types of knowledge activity [12], methods to assess a firm’s stage of knowledge management, classification of knowledge [27], and a discussion of the capabilities of different Knowledge Based Systems [26].

The fundamental capabilities of Knowledge Based Systems can be categorized into five areas: knowledge capture, knowledge organization, knowledge formalization, knowledge distribution, and problem solving application [26]. Each capability requires a specific technique or technology. For example, knowledge capture requires a system that will allow knowledge acquisition and knowledge representation to occur.

One approach to discussing KM is to divide it into separate stages: knowledge creation, knowledge capture, knowledge storage, knowledge dissemination, and knowledge application. Not all KM efforts include all five stages. Different approaches are applicable at each stage.
In the context of supply chains, knowledge creation is relevant, for example, in the process redesign associated with the implementation of supply chain planning systems. Each supply chain entity knows part of the process, but until the initiative brings these disparate pieces together, the complete knowledge of the SC process doesn’t exist.

A knowledge base stores information on best practices that have been successful in one supply chain environment in such a way so that the knowledge can be easily located. Relative to automotive supply chains, a knowledge base might store information on implementation of materials management processes at supplier locations. Supply chain management is broad in scope, involving many processes, so taxonomies like the one presented in [15] may be helpful for organizing knowledge bases.

In the supply chain, dissemination issues address both explicit and tacit knowledge—coordinating the supply chain often requires development of explicit techniques and procedures—such as presented in the CPFR users guide for Collaborative Planning, Forecasting and Replenishment [39]. SCM may also involve tacit knowledge, as in understanding the internal policies regarding the management of shortages, for example.

In a supply chain, best practices are sometimes adopted, but more typically adapted to suit a different supply chain environment. Best practices are usually identified from benchmarking studies, and in many cases the benchmarks are world-class operations. Importantly, the best practice needs to be relevant in the context of the firm’s operational strategy—an often-overlooked issue in the sharing of best practices in companies.

The use of knowledge as an asset in vertical channels has been studied in marketing channels [7, 16]. These earlier studies analyzed the exploitation of knowledge bases and building information value from the perspective of organizations at the beginning of the vertical channel. In our study, we are interested in the perspective of a downstream organization, and how we can increase the performance of that organization through the introduction of a knowledge management system.

3. Problem Description – Case Study

In this section, we describe a service parts department at an automotive dealership and the ordering problem they face as a motivating case study for this research. The case study was conducted over a four-month period and involved a series of initial and follow-up interviews with the service-parts manager at one dealer location. Semi-structured interviews were conducted, with one member of the interviewing team posing questions (and follow-up questions when interesting responses surfaced) while the other two members of the team recorded responses (those responsibilities rotated evenly across the three member team). Confidentiality was requested for some data; otherwise, interview data are available from the authors.

3.1 Organization Background

Jim Koons Automotive sells new and used cars from 15 dealer locations in Virginia and Maryland and an online Internet sales site. Koons Automotive offers cars made by DaimlerChrysler, Ford, General Motors, Mazda, Toyota, and Volvo. Three locations specialize only in used cars. In 2000, Koons Automotive ranked 18th in the United States in terms of total sales dollars, with $978 million dollars in sales, selling just under 50,000 cars [41]. In 2001, they became a billion dollar business [20]. As of April, 2002 one of their Toyota dealerships ranked fourth in the US for internet sales, having sold approximately 1800 cars for $42 million in sales. Six of his other dealerships also rank in the top 100 e-dealers list in the nation [40]. John Koons Sr., the father of Jim Koons, founded the first Koons dealership in 1964. John Koons Sr. was the first auto dealer to enter the Automotive Hall of Fame. He eventually sold his dealerships to his children. Jim Koons is the CEO of Jim Koons Automotive, while other members of his family (siblings and nephews) run their own separate companies associated with the automotive industry.

Koons’ mission statement encourages strategies that emphasize customer satisfaction over strategies that emphasize cost minimization. Customer satisfaction is extremely important at Koons, and close attention is paid to CSI – customer satisfaction index – results. Hanging in the service bays are several banners that list the Koons ethos:

"Rule # 1: If we don’t take care of the customer, someone else will."

"We Believe..... Sales opens the door for service and service opens the door for sales."

"We Believe..... Together everyone achieves more."

"We Believe .... Teamwork assures satisfied customers again and again."

Part of the reward system at Koons is based on customer satisfaction, using the CSI measure. CSI is measured in the form of a survey for new car sales and warranty service. The CSI measurement is reported for the month, three-month average, and yearly average. There are 4 key areas in CSI – new car sales, service, body shop, and service parts. If the CSI 3-month average for the dealership is a targeted percentage above the market area average, all employees in those four areas receive a 5% bonus. If the CSI 3 month average is at the market area average, then there is no bonus. If the CSI 3 month average is below the market area average, all employees in those areas have 5% of their pay deducted. At the same time, however, management at Koons...
rewards managers and employees with profit-based bonuses, which often surfaces conflicting goals between departments (see below for compensation schemes for service parts). There is evidence that the impact of attaining or not attaining CSI benchmarks is real.

3.2 Service Parts Management

The parts department of Koons’ flagship dealership at Tysons Corner is the focus of this case study. This dealership employs approximately 180 employees, with sales of $131 million in 2000 [41]. The dealership sells new Chrysler car models (manufactured by the DaimlerChrysler Corporation), and new Chevrolet cars and trucks (manufactured by General Motors), as well as a variety of used cars through their used car department.

The parts department employs 20 employees, with sales of approximately $7 million a year. The organizational structure of the dealership, detailing the parts department is shown below.

![Organizational Structure Diagram](image)

**Figure 1. Jim Koons Automotive Organizational Structure**

The manager of the service parts department has been in the automotive industry for over 18 years, beginning after high school as a driver for a parts department at another dealership. Over time, he has held a variety of positions at different dealerships, to include service advisor and service manager. He has been in his current job for two years, which entails providing parts to both internal and external customers, and maintaining the inventory to support those sales. The internal customers include the service department, the body shop, and new and used car sales. The external customers include walk-up retail customers (individual consumers) and wholesale customers (other dealerships, tire shops, etc). He is responsible for a $1 million dollar parts inventory, and is expected to hold on average no more than two months supply at any time. On average, he normally holds 2.8 months supply, which has been a point of conflict with upper management. In addition, he is responsible for ordering and maintaining general MRO (maintenance, repair and operations) supplies for the dealership. Tables 1 and 2 display inventory and ordering data as of the beginning of April 2002.

The parts and supplies are obtained from a variety of sources. A majority of the parts are either shipped directly from the OEMs (GM and Chrysler) or from their distribution centers. Some parts are obtained from local parts vendors, and the MRO supplies are obtained from wholesale suppliers. Orders to the OEMs are placed through the Universal Computer System (UCS), the Dealer Management System used by Koons. GM orders are placed daily, while Chrysler orders are weekly. Both OEMs will take promotion or rush orders anytime.
Table 1. Inventory as of April, 2002. Figures are disguised.

<table>
<thead>
<tr>
<th></th>
<th>$ Value</th>
<th># of Parts</th>
<th># of Pieces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chrysler</td>
<td>$400,000</td>
<td>11,000</td>
<td>33,000</td>
</tr>
<tr>
<td>Chevrolet</td>
<td>$500,000</td>
<td>25,000</td>
<td>28,000</td>
</tr>
<tr>
<td>Misc</td>
<td>$50,000</td>
<td>400</td>
<td>15,000</td>
</tr>
<tr>
<td>MRO (housekeeping)</td>
<td>$10,000</td>
<td>200</td>
<td>2,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$960,000</strong></td>
<td><strong>36,600</strong></td>
<td><strong>78,000</strong></td>
</tr>
</tbody>
</table>

Table 2. Outstanding orders as of April, 2002. Figures are disguised.

<table>
<thead>
<tr>
<th></th>
<th>$ Value</th>
<th># of Parts</th>
<th># of Pieces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chrysler</td>
<td>$15,000</td>
<td>300</td>
<td>650</td>
</tr>
<tr>
<td>Chevrolet</td>
<td>$17,500</td>
<td>320</td>
<td>2,800</td>
</tr>
<tr>
<td>Misc</td>
<td>$1,000</td>
<td>25</td>
<td>35</td>
</tr>
<tr>
<td>MRO (housekeeping)</td>
<td>$4,000</td>
<td>10</td>
<td>95</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$37,500</strong></td>
<td><strong>655</strong></td>
<td><strong>3,580</strong></td>
</tr>
</tbody>
</table>

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Each day the UCS generates a list of stock numbers with inventory levels that have fallen below the recommended re-order point. The orders are then automatically generated with the quantities filled in that would bring the stock levels back to the recommended levels. The parts manager then manually scans each order for parts that may qualify for quantity discounts (see OEM promotions below) and often times adjusts the quantities accordingly.

The service parts manager can check parts availability with Chrysler and other Chrysler dealers on a web-based system. Chrysler’s parts distribution center (PDC) for this area is Newark, Delaware. The manager checks availability with GM using an automated phone inquiry system. In order to check availability of GM parts at other GM dealers, the manager must go through a third party web-based system maintained by Parts Voice. If the service parts manager locates a part he really needs at a dealer, he can call him directly and negotiate for markup. The receiving dealer also pays freight charges. This doesn’t always work well because some dealers do not update their records online regularly, and not all are willing to share their inventories with a competitor. Sometimes the OEM helps the service parts manager find parts, and arrange for shipping without a markup.

A pictorial representation of the supply chain for Jim Koons Automotive is illustrated in Figure 2 below. The left half of the diagram illustrates the supply network to the automotive dealerships, and includes OEM’s, outside part vendors and MRO suppliers, and transportation providers. The dealer organizations are identified in the central column. Note especially that there are a variety of "customers" for parts. Internally to the organization, parts are "sold" to the body shop, the service department, new car sales, and used car sales. Externally to the organization, parts are sold to wholesale customers and other Koons dealers, and walk-in customers.

With the exception of the CSI bonus or reduction mentioned earlier, the manager is compensated strictly as a percentage of the amount of profit he can generate in his department at a rate of 8% of the net profit. Traditional overhead expenses such as employee salaries, training, and tools and equipment are taken off gross profit. His goal is to maximize the net profit in his department. Net profit can be maximized through some combination of increasing total sales, reducing overhead expenses, or increasing stock order discounts on inventory. Figures for the parts department are included in Table 3 below. (The numbers are disguised; however, the percentages are approximately correct. Note that the current parts manager arrived just after the December 1999 figures were posted.)

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1 Non-OEM parts and supplies such as promotional t-shirts, coffee cups, etc
The average markup for internal sales and walk-in retail customers is 42%, while the average markup for wholesale customers is 10 -15 %. In general, sales to internal customers (body shop, service and new cars) cannot be affected by the parts manager. He has little control over how many cars come into the shop for service or repair. Demand by the different internal departments is also seasonal – higher in the winter due to bad weather and more accidents, and more routine service maintenance in the summer. He also has little impact on sales to walk-in retail customers. While internal and retail sales carry a higher profit margin, increasing these sales is not a viable path to increasing net profit.

Sales to wholesale customers can be increased by increasing the dealership’s share of the local service parts market. The dealership has sizeable wholesale sales to body shops and to other dealers within the greater metropolitan region. These sales are for individual parts that the other dealers cannot acquire quickly enough from the OEM, and also for larger quantity of parts sold to external customers that include body shops. In the two years since he has been the parts manager, gross dollar sales have increased 40%, with the majority of that increase due to the increase in wholesale transactions.

Freights costs are also a part of the expense of managing service parts. Standard practice in the industry is for OEMs to pay the freight into the dealership – so Koons only pays freight if they are expediting from the OEM or from another dealer or if they are shipping to a customer. These wholesale parts are generally transported by three modes – by courier to

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**Table 3. Sales and Profit Figures**

<table>
<thead>
<tr>
<th></th>
<th>Dec, 1999</th>
<th>Mar, 2002</th>
<th>% Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Sales</td>
<td>$300,000</td>
<td>$420,000</td>
<td>+ 40%</td>
</tr>
<tr>
<td>Less purchase price of parts</td>
<td>$225,000</td>
<td>$312,750</td>
<td>+ 39%</td>
</tr>
<tr>
<td>Gross Profit</td>
<td>$75,000</td>
<td>$107,750</td>
<td>+ 44%</td>
</tr>
<tr>
<td>Less Overhead</td>
<td>$50,000</td>
<td>$74,500</td>
<td>+ 49%</td>
</tr>
<tr>
<td>Net Profit</td>
<td>$25,000</td>
<td>$33,250</td>
<td>+ 33%</td>
</tr>
</tbody>
</table>
local facilities, by private fleet to sites a bit more remote and out of the normal delivery range for the courier, and by package delivery service to dealers anywhere in the U.S. or overseas.

Decreasing overhead expenses can affect net profit. However, a large percentage of overhead is payroll expenses. Over time, the parts manager has steadily employed personnel at higher salaries. Since he has been in the job, overhead expenses have increased by 49%.

The third way the manager can increase net profit is to decrease the purchase price of service parts. The OEMs offer a variety of promotions that provide quantity discounts (known as stock order discounts) for specific ordering levels and/or specific stock-item orders. GM will also give an additional 1.5% discount for specified Chevrolet parts maintained at 90% of their recommended inventory levels. Not only do these promotions vary by the OEM, they are also complicated and difficult to track. Frequently the manager will not know the ordering level required to obtain the discount and will lose out on an opportunity to acquire the stock at a lower cost.

This decision is also complicated by tradeoffs between lower prices and higher overall inventory levels. The parts manager is expected to hold a maximum of 2 months supply of inventory, and receives pressure from management when the inventory level exceeds this amount. Management would prefer to spend the money they consider “over” invested in inventory on the purchase of new cars they could then sell for profit. However, the parts manager frequently exceeds the recommended stocking level when ordering large quantities of parts to obtain stock order discounts.

### 3.3 OEM Promotions

The OEM promotion details differ by manufacturer. GM publishes standard quantity discount rates for specified parts. In addition, they periodically offer time-based discounts for Qualified Parts Orders (QPO). The discounts are only valid if the specified dollar amount is reached on one order – in other words multiple orders over time cannot be combined to obtain the discount. Unfortunately, the dollar amounts required to obtain the discounts are often too high for this dealer location, and discounts on GM parts are not often received.

Chrysler also publishes standard quantity discount rates for specified parts in a 2-page brochure disseminated quarterly. In addition, they publish a 60-page catalog that describes their complex discount schemes. One example of a straightforward Chrysler promotion would be a 10% discount for an order valued between $3,000 and $6,499 for air conditioner compressors for the Chrysler Concorde. Orders valued greater than $6,500 would receive a 20% discount. Some Chrysler discount schemes are not so straightforward, however. An example of a complex discount scheme would be a 23% discount for ordering any mixture of air conditioning compressors and condensers that totals 30 units, with the same discount of 23% applied to refrigerant if you order more than 5 units of Freon on the same order. As with the GM orders, in order to receive the discount the specified amounts must all be on one order. An additional complication with the Chrysler orders is that to receive the discount, the corresponding promotion code for the discount must be included on the order in a flag field. If the promotion code is not included, the dealer will not receive the discount.

Both GM and Chrysler orders are placed on line. However, neither system notifies the dealer that they are close to the threshold level for receiving a discount. The parts manager spends hours daily going through each order manually before it is placed looking for opportunities to receive discounts by increasing the order for certain parts. He often holds orders for parts until he reaches the threshold required for the discount, allowing the stock on hand to deplete to very low levels. In order to achieve maximum efficiency in his job, the parts manager must keep track of several variables at the same time (e.g. current and projected inventory levels, specific quantity discount schemes, parts availability, etc.). While most of these variables are available to him in some manner, none of the information is integrated in a fashion that allows him to maximize the discount schemes available while holding inventory at a level that will both adequately service incoming customers and satisfy upper management.

### 3.4 Knowledge in the Service Parts Ordering Problem

The problem of service parts ordering is multi-faceted and includes aspects of both supply chain management and knowledge management. From a decision theoretic viewpoint, this problem involves (1) deciding how much to order and when, considering both costs and customer service. The tasks that are accomplished in practice with knowledge include identifying relevant costs, deciding how to incorporate inventory costs and the acceptable customer service level, and selecting appropriate performance measures for this ordering problem. These inputs to the process are often scattered in the organization, so pulling them together from multiple sources is a key issue in the knowledge management solution. Additionally, the decision approach incorporates both a recommended
solution to the ordering problem, along with simulation to enable the manager to evaluate alternative decisions.

There are several facets of the ordering decision that require the application of knowledge. When deciding how many parts to order at any one time, the parts manager must first determine for each part (1) the desired inventory level and (2) a forecast of sales. The forecast is estimated based on a look back over time that computes the historic average sales volume per day. He then multiplies the average sales volume by the number of days of inventory he wishes to hold for each part. The information system utilized for this activity – UCS – requires that a number of parameters be established and maintained. To establish the value of these parameters, the service parts manager’s experience is essential.

Determining the optimum order quantity is also difficult. While the current system does generate a recommended order quantity, it does not consider things such as promotional schemes, seasonal trends, or product life cycle trends. With his knowledge of the auto industry, he is able to decrease the recommended order quantities based on his estimates of whether or not a particular part will soon be obsolete, or increase the order quantity if a part is used in a model that has just been released.

As demand forecasts play an important role in determining inventory policy, the error and the uncertainty associated with forecasts is also important in this problem. In practice, uncertainty in sales is addressed using safety stock, based on a desired service level and the expected sales rate. The aspect of this part of the problem that is accomplished with knowledge, then, is the development of a forecast that captures as much knowledge about future demand as possible. This uncertainty of demand makes this problem considerably more difficult than a deterministic inventory problem. Accordingly, we utilize a decision methodology in the KM solution that allows specific knowledge about how future sales can be expected to vary from observed history.

The efficacy of the service parts department incentive structure is also an important part of the knowledge management problem. Dealerships typically use a combination of net profit and customer satisfaction - as measured by CSI - to reward the performance of the units in the organization. The service parts department is additionally measured against a cap on total inventory in the operation. The combination of CSI, net profit, and inventory are conflicting goals, however. For example, the body and service repair shops focus on making a profit and keeping the customer happy. If a car is in for service and the part is not available at the dealership because of an inventory minimizing goal, the part will be shipped from another dealer or from a parts distribution center incurring higher freight costs for expedited delivery. The freight costs are then charged back to the parts department, penalizing the parts department. This may result in sub-optimization by the service parts manager who incurs freight penalties, albeit with lower inventory costs. Currently, these tradeoffs are managed by the service parts manager to meet the established performance goals, or at least to violate them to a level that is acceptable to management. To capture this knowledge related aspect of the problem in our solution, we provide a set of performance metrics to enable the evaluation of recommended and alternative solutions.

Additional SCM and KM issues include (4) data for making the decision are scattered, (5) data are in non-standard formats (Chrysler parts promotions are in different formats from Chevrolet data), and (6) decision implications of the parts promotional data are non-obvious. Taking all six of these desiderata simultaneously, it is unclear what the best course of action is for the parts manager. This is where a knowledge management system (KMS) can be of assistance to him.

4. A Knowledge Management Approach to a Solution

Discussions with the parts manager identified several specific areas of his job that could be improved through the use of a knowledge management system. A knowledge management system (KMS) to assist the parts manager in his decision-making would be comprised of three components. These are (1) the ability to access OEM promotions electronically, (2) a simulation facility, and (3) the ability to integrate OEM promotions with the existing on-line ordering facility. Here, we focus on the end-user interface and address the technical details of implementation in a separate paper. Optimally, multiple windows could be open simultaneously so the manager could readily note and transfer information from one window (e.g. special promotions) into another window (e.g., the simulation engine). Specific characteristics of each of these three components include:

(1) All relevant OEM discount offers should be displayable. Furthermore, the parts manager should be able to array these data in any format desired--by expiration date of the offer, by inventory category, by dollar value, or some other arrangement.

(2) The simulation engine should provide a recommended solution, as well as allow the parts manager the capability of running "what-if" tests before placing an order with a vendor. The manager should see the effect--over time --on multiple performance criteria that are both cost based as well as responsiveness based. Therefore, ordering costs, price discounts, as well as
inventory on hand under various demand conditions (pessimistic, most likely, and optimistic) should be viewed. Additionally, the incentive implications for him personally as well as for the department, along with the overall dealership performance should be viewed. The details of the recommended solution and simulation are described in a separate paper.

3) Finally, the parts manager should have the capability of integrating the OEM promotion schemes with the online ordering facility. The current process involves printing out the pro-forma order from the system, manually checking the order for those parts that may qualify for an order, and then adjusting the order accordingly. The new system would have the capability of automatically flagging those parts that qualify for a discount and display the quantity required to qualify for the discount scheme. Parts that qualify under a combination quantity discount scheme would also be flagged.

We observed the following: The decision rules for deciding what and how much to order is based on a combination of historical data that shows sales trends and a desire to order just enough to get the discount. The parts manager will delay an order a week or so to allow the order to accumulate to the level that qualifies for the discount, even if that means the current inventory levels will be lower than recommended. The parts manager tends to keep his reorder points higher than recommended, in order to be able to “wait it out” for the opportunity to order a higher quantity at a later time. This gives the stock a chance to deplete, but not to a dangerous level since it was over the recommended order point anyway. The manager's contribution to customer service is to avoid stock outs that would cause customers in the body or service department to have to wait for their cars. Even with allowing the inventory to fall below the recommended inventory levels, the manager very rarely experiences stock-outs.

5. Conclusions

In this paper, we have argued that supply chain management would benefit from the incorporation of knowledge management techniques. We examined typical supply chain systems and, focusing upon service parts management, indicated how knowledge management could be productively incorporated. In a case study, we examined in a fair amount of detail the supply chain problem confronted by a parts manager of an automotive retailer of considerable size. The principle issue confronting him is how to take maximal advantage of the various parts promotions that OEMs offer the dealership. For that parts manager, we proposed a KMS to assist him, and we received feedback from him that our proposed KMS would be of considerable benefit to him. Our proposed KMS would allow the parts manager to systematically incorporate information from the OEMs regarding the variety of promotions they offer and to examine the impact of exercising various promotions to various degrees (e.g., how many parts are ordered and what the resulting impact is on his inventory position, cash position, ability to negotiate with other subunits and outside organizations, as well as on his personal profit position). Our proposed KMS, by virtue of its ability to make large masses of information intelligently actionable and by virtue of its ability to improve performance indices for the three major stakeholders in this process, satisfies the requirements to be a knowledge management system.

There would of course be upfront costs in designing and implementing such a KMS. There would be time delays and further costs in training parts managers in using such a KMS. However, having such a KMS in place would provide net benefits for three important stakeholders in the supply chain: the parts manager, the OEMs, and the end customers.

The implications of having such a KMS in place would be realized differently by the three primary stakeholders, but the net effect on each would be positive. First, by being able to better take advantage of a fuller range or vendor promotions, the parts manager would realize higher net profit and therefore higher income. Second, the OEMs would succeed in “pushing” more product, and more of the product they desire to push, downstream in the supply chain. Third, end customers would encounter fewer stock outs, and might even encounter lower prices on selected parts. Thus, implementing such a KMS would result in a win-win-win situation.

In conclusion, we believe we have shown that KM can provide positive assistance to this parts manager and his problems in working with the supply chain from two OEMs. In addition, we believe that KM offers the potential for further benefit to supply chain systems. Examination of other parts of the supply chain where KM could be assistance would result in additional gains.

6. References

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