Towards More Integration: Investigation of Iranian Pharmaceutical Logistics Providers

Ali Tamaddoni Jahromi Mehrad Moeini Jazani
Department of Industrial Engineering, Tarbiat Modares University, Tehran, Iran
(Email: alitam-6@student.ltu.se, mehmoe-6@student.ltu.se)

Abstract In this paper we have investigated the current situation of Iranian Pharmaceutical logistics providers. Based on our interviews with logistics experts we identified the problems of the business model and proposed 2 information-based solutions to improve the efficiency and effectiveness of pharmaceutical supply chain industry. Our proposed solutions lead to more integration and information transparency among players of this industry. Then based on expert opinions and literature we identified barriers to implement these solutions in Iranian pharmaceutical companies. Ranking these barriers based on expert opinions we formulate our recommendations to tackle these barriers.
Key words logistics provider, supply chain management, pharmaceutical industry

1 Industry Background

There are 6 major players in pharmaceutical distribution industry of Iran. Which we have labeled them as company D, Company H, Company R, Company F, Company A, and Company M, with the following market shares respectively: 23%, 20%, 17%, 15%, 13%, and 12%. Other players of Iranian pharmaceutical industry include 60 manufacturers producing different types of drugs and 10000 drugstores, selling drugs to consumers around the country.

All of these distributers are working traditionally and each of them has relatively numerous staff, ranging from 50 to 120, called Visitors. The role of a visitor is critical in achieving more market share and keeping tight relationship with drug-stores. These visitors meet their assigned drug stores in a regular time period and take the orders. By the end of the day all of these visitors gather in the head quarter and the orders will be accumulated manually. The aggregated orders will be announced to the distribution warehouse via telephone. The next day the warehouse staffs should prepare the orders to be delivered by truck to stores in future. If the orders were not available at the warehouse they will inform the head quarter at the end of the day. In case of stock out the head quarter should inform the manufacturers to send those specific products. In normal situation, the lead time from order release until receiving the order by drugstores usually takes 14 days. In the case of stock out it takes 3 weeks or more depending on the type of product. It is interesting to be mentioned that distribution centers usually order to manufacturers for at least 3 months of stock. This is due to the lack of real time data and the existence of push system in pharmaceutical supply chain.

Beside all members in the procedure, visitors play a momentous role in this chain. They should keep a friendly and tight relationship with drugstore managers and try to up-sell and cross-sell the products to them. In this way they play an important role in gaining more market share and customer retention. The more the visitors, the more the market share a distribution company has. As an illustration, Company D which is a market leader in pharmaceutical distribution in Iran has 120 visitors around the country.

In this report we have tried to analyze the pharmaceutical distribution companies in Iran and provide electronic solutions and strategies to improve the efficiency and effectiveness of each company Iranian pharmaceutical logistics companies. It is noteworthy to be mentioned that logistics service providers in Iran are traditionally independent companies which are apart from manufacturers.

2 Literature Review

The scope and role of logistics have changed dramatically over the years. Logistics used to have a supportive role to primary functions such as marketing and manufacturing. But now they have expanded to cover warehousing and transportation activities, purchasing, distribution, inventory management, packaging, manufacturing, and even customer service (Bowersox and Closs, 1996). More importantly, logistics management has evolved from a passive, cost-absorbing function to that of a strategic factor which provides a unique competitive advantage (Bowersox and Closs, 1996; Bowersox and Daugherty, 1995; Christopher, 1993).

2.1 Definitions of logistics and logistics management

Christopher (1992) defined logistics management as the supply chain processes that plans, implements, and controls the efficient, effective flow and storage of goods, services and related information from the point of origin to the point of consumption in order to meet customers' requirements. Within a supply chain network, logistics service providers act as a bridge to formulate the linkage between the upper and lower supply chain parties' processes (Chan and Chung, 2005).

Gregory T. Gundlach et al (2006) defined logistics management as total inbound and outbound flow and storage of goods, services, and information with an emphasis on integration.

Logistics and distribution firms play a key role in supply chain system. They connect manufactures and suppliers to retailers and consumers. One of the recent issues in supply chain management is the matter of integration through information technology. Firms are making their supply chain activities increasingly visible by using IT to serve better customer demands for accurate real time information. Accordingly, the design and implementation of online logistic service systems that enable instantaneous and continuous communication within and between firms has become a key priority for many organizations. (J.B. Rae-Smith and Alexander E.Ellinger, 2002) It is essential for top management to understand that technology is more than a tool of their business strategies, but rather the foundation for effective planning.

2.2 Logistics and Information Technology

Looking at the activities which logistics members are supposed to do, it is possible to distinguish 2 main categories of activities. Firstly a physical flow management and secondly is the information flow management between retailers and manufactures. With the growth in new information and communication technologies, managing the flow of information has become as vital as managing the flow of material. (Jaana Auramo, Anna Aminoff, Mikko Punakivi, 2002). Applying Information and Communication Technologies, (ICT) can be a significant source of competitive advantage to firms. This is particularly so for the logistics industry because of its dependence on information for efficient operations.

Logistics ICT refers to the hardware, software, and network design required to facilitate processing and exchange (Closs and Xu, 2000). It thus includes related components in the supply chain, such as satellite transmissions, Web-based ordering, electronic data interchange (EDI), bar-coding, electronic ordering systems (EOSs), order processing, point-of-sale (POS) systems, vehicle routing and scheduling, inventory replenishments, automated storage, and retrieval systems, to name a few.

In 1985 Michael Porter proposed the concept of value chain. A value chain is a chain of activities. Products pass all activities of the chain respectively and at each activity the product gains some value. The chain of activities gives the products more added value than the sum of added values of all activities independently. The value chain categorizes the generic value adding activities of an organization. The primary activities include inbound logistics operations, outbound logistics, marketing and sales, and services. The supporting activities include administrative infrastructure management, human resource management (HRM), R&D, and procurement. Figure 1 shows the activities in value chain.

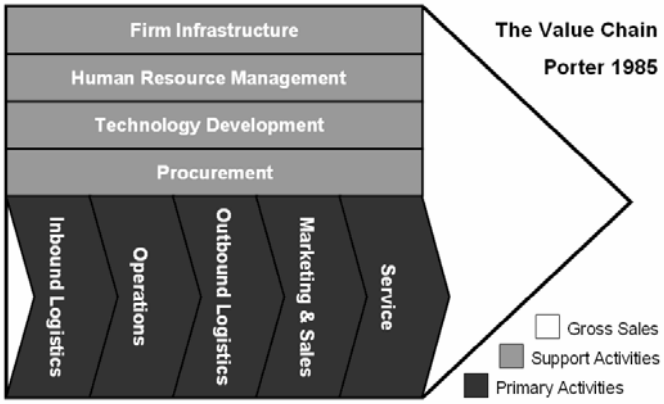

Figure 1 The value chain-Porter 1985

In recent years by growing of Information Technology, the business model of organizations has been changed. The transactions costs among companies have decreased drastically due to implementing Information Technologies. The new strategy concepts has emphasized that companies should focus on

their core businesses in which they can gain competitive advantage and outsource non-core business activities.

A recent trend in outsourcing is the emergence of Third-party logistics service providers (TPLs). Manufacturers are focusing on their production processes as their core business and they are unbundling logistics activities to the TPLs.

2.3 Definitions of Third-Party Logistics

Third-Party Logistics (TPL) providers can be seen as supportive supply chain members. This implies that logistics service providers should support alternative supply chain strategies. Lambert et al. (1998) define supportive members as "companies that simply provide resources, knowledge, utilities or assets for the primary members of the supply chain". Benefits that supply chains can achieve from TPL services, based on literature, are that they can concentrate on logistics management, improve overall performance, find global solutions, enable entry to new markets, control costs, investments, and services, improve customer satisfaction, improve flexibility, and find more cost efficient service solutions. In general outsourcing of logistics services adds value when it enhances the performance of the company (Anu H. Bask, 2001). It is important to be mentioned that all Iranian pharmaceutical logistics providers will categorized as Third-party logistics providers because they are working independently from manufacturers.

Recently some of the TPL providers are treating information flow and physical flow independently. That is, there are 2 modified types of logistics: first, Virtual Logistics in which ownership and control of resources is effected through Internet (or intranet) applications rather than direct physical control, and resources can, thereby, be owned and utilized remotely. (Mike P. Clarke, 1998) second, there are some TPLs who have concentrated on delivery and storage based on information gained from virtual TPLs.

3 Research Methodology

To provide proper solutions to improve efficiency and effectiveness of pharmaceutical logistics services in Iran, we conducted interviews with six pharmaceutical logistics experts, each from one of the major companies mentioned in the background section of the report. Interviewing these experts, we were pursuing 3 objectives:

- Identifying current problems of Iranian pharmaceutical logistics
- Identification of barriers to implement our solutions
- Ranking the barriers based on these experts opinions

4 Analysis

4.1 Identifying current problems

Based on 6 interviews with experts in Iranian pharmaceutical distribution companies, we have reached to the following problems:

- High delivery lead-time
- Lack of transparency of demand information
- The high number of visitors which causes difficulties in managing human resource and also increased the payment cost
- Lack of real time connection between drugstores and distribution head quarters and also between head quarters and manufacturers
- Push system instead of pull system in supply chain
- High inventory costs due to the lack of real time information

4.2 Solution provision

We have provided 2 types of solutions. The first one needs less change and tries to keep the current resource layout. The scope of this solution is just to integrate one logistics provider with its customers and suppliers. The second solution, on the other hand, involves more radical change and tries to integrate all of the distribution companies, drugstores, and manufacturers around the country. The reason behind providing 2 solutions is that the resistance to change which we assumed to exist among Iranian pharmaceutical distribution companies.

4.2.1 The first solution

As mentioned above in this solution we have tried to preserve the current resource layout of the logistics providers. Applying Personal Digital Assistants (PDAs), each logistics companies can improve its processes drastically. Visitors armed with PDAs will visit their assigned drugstores to take orders. As

soon as they have taken the orders they entered them in their PDAs and send the data via Short Message Service (SMS) to a central database established in distribution warehouse. The orders will be processed and the inventory will be checked if the orders are available at the warehouse, a confirmation SMS will be sent to the specific visitor and the data on the database will be updated. By receiving each SMS order from visitors, warehouse staffs will extract the products and gathered them in the specific location based on their types. These products will be delivered to the customers the next day.

Applying this system will clarify demand information. As the demand side will be transparent the amount of required product will be estimated. In addition the amount of safety stock will be calculated approximately. As a result, the stock out situation will be prevented and customer churn will be decreased. Advantages of this solution in comparison with the current situation are as following:

- Demand data transparency
- Delivery lead time reduction
- Pull system instead of current push system
- Inventory cost reduction
- Stock out prevention
- Not eliminating visitors (as discussed before, visitors are the key element of the distribution companies to keep tight relationship with drugstores, in addition eliminating visitors in the first action will cause strong resistance from managers and employees against the solution)

4.2.2 The second solution

A more improved solution of this case is through re-intermediation among pharmaceutical industry players. A virtual organization which is supposed to manage the flow of information from drugstores to all logistics service providers and from manufacturers to logistics service providers will be imposed in the traditional supply chain (Fig 3). In this way all the players of this industry will be connected together (distributors, distributers, and producers). This virtual organization acts as internet portal in practice. The portal acts as a virtual warehouse and helps in virtual stock control. In other words we enter the environment of virtual logistics.

Before going into details of our proposed virtual logistics we have to clarify the definition of a critical concept in this field. This important concept in virtual logistics systems is virtual warehouse.

In most warehouse systems, stock tends to be held in a geographically concentrated manner. That is, distribution companies prefer to hold their stock under one roof or under as few roofs as possible. The advantages of this are:

1) Information about stock can easily be accessed.
2) Stock can easily be organized and controlled.

By using the information systems, geographically concentration of stocks no longer will be needed.

Virtual warehouse is a central database encompassing all distributors' inventory information. All the orders from drugstores come to this database and order processing will be performed on this virtual organization. On the other side, the distribution companies and even manufacturers have access on this database. All of these connections will be stand via internet to this database.

The physical location of the stock items, however, would be geographically dispersed. This is shown diagrammatically in Figure 2.

The advantages of holding stock in this manner include:

1) There is much more flexibility in the size of warehouses employed. The constraints that walls impose are, in effect, removed.
2) There is potential for much greater warehouse capacity since the constraint on capacity is total available warehouse resource, not just locally available warehouse resource.
3) There is potential to support a much larger order size.
4) There is potential to support products with more diverse handling characteristics (Fig. 2).
5) The risk associated with holding stock at only one site may be reduced.

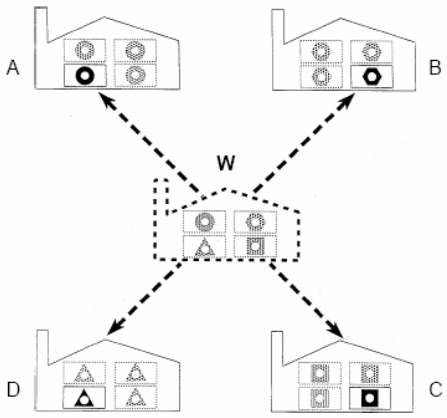

Figure 2

Applying the second solution

According to the above theories the next step in development of pharmaceutical distribution channel is to create a kind of virtual warehouse as a portal of information in this industry, and add it to this distribution channel as shown in figure.3.

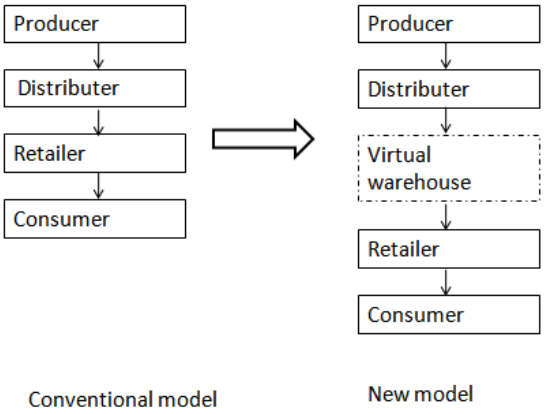

Figure 3 Re-intermediation of traditional supply chain

The virtual warehouse that has been penetrated to the distribution channel, acts as a portal enabling with the central database which contains all relevant information related to the major distributers in market and also the amount of each product which is stored and available in each individual drugstore. Drugstores and distributors will be connected to this database through internet.

All drugstores must be equipped with a personal computer and a barcode reader. The moment a distributor sells an item the information of this transaction will be transmitted to the PC which is located in the pharmacy via barcode reader. Since this PC is connected to the main database (the virtual warehouse), the database can track the amount of inventory in each drugstore. When the quantity of every single item in drugstore reaches to a pre-determined quantity (re-order point), the virtual warehouse will inform the specific distributor, who is in charge of dispersing that product, to supply the drugstore with the required product. When the delivery of products to the drugstore is confirmed by the distributer, the delivered amount will be subtracted from the distributer inventory and be added to distributor's inventory in the database.

Likewise when the measure of inventory of each item in distributer's warehouses reaches the reorder point, the database (virtual warehouse) will send a request of delivery to specific manufacturer and when the delivery is confirmed, the delivered amount will be added to distributor's level of inventory.

Needless to say that all parties (virtual warehouse, distributers, and producers) are connected to each other through internet and both distributers and producers have the online access to the information in database.

The advantages of this solution in compare with the current situation are as following:

- Delivery lead-time reduction
- Detailed and transparent demand information: this element helps distributers to have an appropriate estimate about products demands, respectively manufacturers will be able to better plan for production
- Elimination of visitors and reduction of HRM tensions
- Real time connection among all players from drugstores to manufacturers
- Changing the supply chain type from push to pull
- Inventory costs reduction

4.3 Identification of barriers to implement solutions

To identify the barriers of implementing our proposed solution, we first take a look at literature. After reviewing the literature, we share our findings with logistics experts in our interviews to evaluate them and compare it with the current Iranian logistics provider context.

The perceived barriers of Logistics Information System (LIS) adoption from the literature are (Ngai, E.W.T., et al., 2007):

1) Difficulty in changing the organizational culture
2) Lack of commitment from the top managers
3) Insufficient financial support
4) Employees' inadequate knowledge of IT
5) Lack of experience in IT
6) Lack of commitment and involvement by all employees
7) Not being perceived as an advantage at all

In addition to the above barriers found in literature, we have found the following barriers from our interviews with Iranian experts:

1) Lack of logistics manager knowledge about the IT benefits
2) Aged logistics managers'

4.4 Ranking the barriers based on experts opinions

To apply the solutions mentioned in previous sections we need to tackle the barriers identified from literature and by experts. By ranking the barriers, we can find the most important obstacles and provide recommendations to remove this barriers and at last implementing the solutions. This is an important step in formulating the strategy to change the current traditional pharmaceutical logistics systems in Iran. To rank the barriers we first find the weight for each barrier based on expert opinions. Then we asked them to put the score in front of each barrier according to their organizational situations. These scores were odd numbers from 1 to 7. 7 means that barrier is a sever obstacle in that organization and 1 means that it is not important in that respective organization. Table 1show the results of the expert opinions about the importance of factors.

Based on the results in the last column of table 1, it is clear that the organizational culture is the most important barrier among the pharmaceutical logistics in Iran (7.60).

The second important barrier in these companies is lack of commitment among top managers. The third one is insufficient financial support which is one of the commitment shortages among managers. To solve these barriers we recommend that management perspective toward IT based solutions should be improved through training.

By presenting real successful logistic cases, which have applied Information Technology the management mindset would likely change. When managers gain a positive view on IT based solutions, they can then change the traditional culture of the organization and reduce the resistance to change.

The forth and the fifth important barrier among distribution companies relates to IT knowledge and experience of employees. These can be tackled through intensive training programs.

After training employees and changing the management's mindset it seems that IT advantage will be perceived beneficial for the organization which was the sixth and seventh barrier based on table 1.

Besides training will help employees to be interested and committed to be involved in their new business model. At last, the problem related to aged managers seems not to be a critical issue in Iranian logistics companies.

Based on the last row of table 1, we can sort the Iranian distribution companies according to the level of barriers among these companies. For instance, Razi Company has much more barriers to implement IT based solutions than other companies (5.36).

Table 1 Importance of Different Factors From Experts Point of View

Barrier	**Weight**	***Expert Scores (1-7)***						**Total Sum of Barrier**
		Company D	***Company H***	***Company R***	***Company F***	***Company A***	***Company M***	
Difficulty in changing the organizational culture	***0.20***	7	6	7	6	5	7	***7.60***
Lack of commitment from top managers	***0.18***	3	7	7	6	5	6	***6.04***
Insufficient financial support	***0.16***	6	7	5	7	4	5	***5.29***
Employee's inadequate knowledge of IT	***0.13***	4	4	6	5	5	6	***4.00***
Lack of experience in IT	***0.11***	5	4	5	5	2	4	***2.78***
Lack of commitment and involvement by all employees	***0.04***	1	3	2	3	1	2	***0.53***
Not being perceived as an advantage at all	***0.09***	3	4	3	3	4	2	***1.69***
Lack of logistics managers' knowledge about IT benefits	***0.07***	3	4	3	2	3	2	***1.13***
Aged logistics managers	***0.02***	2	1	1	1	4	1	***0.22***
Total (Weight * Scores)	***1.00***	***4.51***	***5.29***	***5.36***	***5.13***	***4.09***	***4.91***	

5 Managerial Implications and Conclusion

In this paper, we tried to investigate the current situation of Iranian pharmaceutical logistics providers. Based on our study and interviews with logistics experts, we identified 6 problems mostly related to the lack of integration between different tiers of pharmaceutical supply chain.

To improve the integration level among players in Iranian pharmaceutical industry, we proposed 2 types of IT based solutions. The first solution considers each distribution company, its customers and its suppliers as a scene for analysis. In this solution the amount of change and integration is less than the second solution.

In the second solution, by introducing virtual distribution center which is assigned to manage the flow of information, we tried to integrate all distribution companies, drugstores and manufacturers together. It is the highest level of integration in the industry. Then we identified the barriers to implement these 2 solutions based on literature and expert opinions. After ranking and sorting the barriers, we could formulate a proper strategy to tackle these barriers.

The most important point to resolve these barriers based on our findings was training in both managerial and operational level of the logistics companies. We expect that good training would provide appropriate atmosphere to implement IT based solutions to solve the logistics problem in Iranian pharmaceutical industry.

References

[1] Anu H. Bask ,"relationships among TPL providers and members of supply chains-a strategic perspective" the journal of business and industrial marketing, 2001, 16(6): 470-486

[2] Bowersox, D. and Closs, D.J., Logistical Management: The Integrated Supply Chain Process, 4th ed., McGraw-Hill, New York, NY, 1996.

[3] Bowersox, D.J. and Daugherty, P.J., "Logistics paradigms: the impact of information technology", Journal of Business Logistics, 1995, 16(1): 65-80.

[4] Chan, F.T.S. and Chung, S.H., "Multicriterion genetic optimization for due date assigned distribution network problems", Decision Support Systems, 2005, 39: 661-75.

[5] Christopher, M., "Logistics and competitive strategy", European Management Journal, 1993, 11(2): 258-61.

[7] Christopher, M. Logistics and Supply Chain Management, Pitman Publishing, London, 1992.

[8] Closs, D.J. and Xu, K. , "Logistics information technology practice in manufacturing and merchandising firms – an international benchmarking study versus world-class logistics firms", International Journal of Physical Distribution & Logistics Management, 2000, 30(10):. 869-86.

[9] Jaana Auramo, Anna Aminoff, Mikko Punakivi, , "Research Agenda for E-Business Logistics based on Professional Opinions", international journal of physical distribution and logistics management, 2002, 32(7): 513-531.

[10] J.B. Rae-Smith and Alexander E.Ellinger, ," insights from the introduction of an online logistics service system, an international journal of supply chain management", 2002, 7(1):.5-11.

[11] Lambert, D.M., Cooper, M.C. and Pagh, G.D. "supply chain management: implementation issues and research opportunities", the international journal of logistics management, 1998, 9(2): 1-19

[12] Mike P. Clarke , "Virtual logistics an introduction and overview of the concepts" International Journal of Physical Distribution & Logistics Management, 1998, 28(7): 486-507

[13] Ngai, E.W.T., Kee-Hung Lai, T.C.E. Cheng, "Logistics information systems: the Hong Kong experience", International Journal of production Economics, 2007, 1-12.