Editorial

by Gurumurthy Kalyanaram

Elements of Supply Chain Management in Pharmaceutical Industry[1]
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We are delighted to present our January issues of *NMIMS Management Review, and Economics and Public Policy Journals*. The quality of the manuscripts and the editorial board speak for themselves.

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Supply Chain Management
Supply chain management examines all activities that impact customer service and satisfaction. Supply Chain analytics can help a firm identify potential areas of improvement. Cost reduction and/or value addition are the criteria for all the activities.

Cost reduction addresses two important topics: effectiveness and competitiveness. One of the ways to reduce cost is to examine the distribution model: try and reduce the role of the middle person who is also known as the wholesaler. Eliminating the intermediary allows for direct relationship between the patient and manufacturing, where the product is delivered straight to the consumer, cut cost and of course, have better profits. This allows the pharmaceutical companies to sell more products at a competitive rate because less money is being spent paying the middle person. Keeping track of products will reduce the number of counterfeits that are on the market. With the advances in design and manufacturing technologies, firms can offer to the end consumers more competitive prices.

Global outsourcing of manufacturing and clinical trials to destinations with competitive advantages in labor, technology and less burdensome regulations will add value and reduce costs.

In this editorial, I discuss briefly two important elements of Supply Chain Management in Pharmaceutical industry: Inventory Management; and Research and Development.

Inventory Management:
The core managerial decisions in inventory management are: How large should an inventory replenishment order be and when should an inventory replenishment order be placed? Inventory levels are dependent on many factors, including sales, liquidity, availability of inventory financing, production, supplier reliability, delay in receiving new orders, and seasonality. An inventory model is able to utilize some of these factors and mathematically determine the optimum level of inventory for the business. The ability to formulate a suitable inventory model is one of the major concerns for an industry or manufacturer.

One such model is the Economic Order Quantity (EOQ) model. EOQ model helps the firm determine the optimal amount of inventory a company should order each time the inventory of that item is depleted. A larger order-quantity reduces ordering frequency and ordering cost, but requires holding a larger average inventory, leading to increased holding costs. A smaller order-quantity reduces average inventory, but requires more frequent ordering and higher ordering costs. Another important technique used along with EOQ is the Reorder Point (ROP) and Safety Stock ROP quantity reflects the level of inventory that triggers the placement of an order for additional units.

Economic order quantity analysis should be applied to every product that represents a significant proportion of cost and sales.

It is recommended that the following actions take place within a company regarding inventory management: establishing purchasing review criteria to review the inventory characteristics; purchase only the amount of raw materials needed for a production run/ for a period of time; collaboration with vendors to improve the purchasing practice; improving of inventory controls through application of effective inventory control systems; encourage material exchanges within the company; and consider just-in-time manufacturing.

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[1] *This article is based on the discussions in the Supply Chain Management class (Pharmaceutical program) in City University of New York. In some cases, I have reproduced verbatim from some of the written outputs from the students. Thanks to CUNY and the students for the learning experience.*

One of the significant innovations in Supply Chain Management is Just-In-Time (JIT) manufacturing[2]. JIT involves having the right items of the right quality and quantity in the right place and the right time. JIT requires manufacturers to handle tasks within a very small-time span and has a big impact on production scheduling. Implementation of JIT manufacturing does have some challenges, such as lack of required information sharing and/or communication between stakeholders, cross-functional conflict and insufficient planning systems.

Research and Development:

Before 1995, pharmaceutical industries used to work on about 500 targets. However, the advances in technologies such as high throughput screening, combinatorial chemistry and genomics have improved significantly the number of targets and leads that can be explored or investigated. For this reason, the selection process when picking out the candidate compounds out of the research has to be precise if the pharmaceutical company wants the process to be quick.

Accordingly, new approaches that can validate new targets and define success criteria for research are important. Here, integration of the bio information at every stage during the drug discovery process and identification of targets at an early stage are critical. Alternative decision models / tools will improve the quality of the decisions during the drug development process.

- One such tool is Pharmacogenomics: study of how genes affect a person's response to drugs. Pharmacogenomics combines the insights from genomics and pharmacology.
- Another tool is modeling and simulation of the preclinical and clinical trials to reduce certain gaps between the early stages of the development of a new drug, and its potential side effects in humans.
- A third tool is more efficient and sophisticated clinical pharmacokinetics would be the answer to the question: Is the drug adequate for the present disease site, for a sufficient time and if there is enough information to provide on concentration-effect- relationships?

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Dr. Gurumurthy Kalyanaram is a distinguished professor, a management consultant and a corporate advisor. Currently, he is an advisor to and professor at International University of Japan. He advises the University on academic and accreditation matters. Dr. Kalyanaram is also a professor at City University of New York, and a visiting professor at NMIMS University and Tata Institute of Social Sciences. He has served as University Dean for Research, Dean for Business, Director of the Master's Programs, Director of Research and as the Senior Faculty Liaison for External Development.

Dr. Kalyanaram has been a visiting scholar at the Woodrow Wilson International Center for Scholars, a fellow at the Center for Russian and East European Studies, and the Inaugural Endowed Professor in Kazakhstan. Dr. Kalyanaram's areas of expertise are marketing, innovation and management science, and international business and strategy. His research and teaching have been eclectic and inter-disciplinary.

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[2] *This was conceptualized and implemented by Toyota in early 1970s.*