



The Logistics Symposium on

**“NEW TECHNOLOGICAL BREAKTHROUGHS & SUPPLY CHAIN INNOVATIONS”**

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## INTRODUCTION

1. Need and wants are the two basic elements of the any of human beings living in the world. The Stone Age was an era thousand years ago, during this period people lived in caves and jungles and their life was so simple. There were only two main commitments that they had in their lives. Those were to protect themselves from the wild animals and to gather food for their survival. It started almost with the evolution of the mankind. For these purposes, people made tools from stones and bones.

2. One of the most important advancements in human history was the development and use of tools. Tools were allowed hominids to become the masters of their environments. They have used these stone tools to hunt, to build, and to perform important tasks that made life easier for them. The tools were made out of stone. The human ancestors during this age lived in caves, and they were invented fire. They made needles out of fish bones and they used them to stitch their cloths from animal skins.

3. In the last stage of Stone Age people were able to discover farming and life became more systematic and convenient. Pots and pans were made out of clay. Large scale buildings were built. Stone walls and straw roof should be seen during this era.

4. Then the other significant change of the history was bartering which was introduced by Mesopotamian tribes that went all the way back to 6000 BC, bartering was adopted by Phoenicians. Phoenicians bartered goods to those who were located in various other cities across oceans. Babylonians also had developed an improved bartering system. This exchanging of goods is still practicing in the modern day international trade, namely counter trade, switch trading and full compensation, Counter purchase can be highlighted. The father of the economics' Adam Smith, identified the development of the financial discipline of the system like barter, is insignificant, but today locally and internationally, exchanging of goods and services are done on barter system.

5. In the 18th century people have changed the manufacturing process dramatically. Instead of items being produced by hand, the owners of the facilities created ways to have machines produce the items. This change in production is known as the Industrial Revolution and it began in England. Ultimately it stretched to neighboring countries such as France and Germany, and by the late 18<sup>th</sup> century it came across to the United States. Some of the major invention which were changed the order of the world trade are as follows;

- a. Steam Engine - James Watt created the first reliable steam engine in 1775.

b. Power Loom - Edmund Cartwright invented the power loom in 1785. It dramatically changed the way cloth was woven.

c. Cotton Gin - Eli Whitney patented the cotton gin (short for cotton engine) in 1794. Prior to the invention of the cotton gin, cotton seeds had to be removed from the cotton fiber by hand. This invention made cotton a much more profitable crop for farmers.

d. Telegraph - Samuel F. B. Morse created the telegraph in 1836. This invention changed the face of communication.

e. Sewing Machine - Elias Howe created the sewing machine in 1844.

f. Internal Combustion Engine - Jean Lenoir invented the internal combustion engine in 1858. Eventually this engine was used in mass transportation.g Telephone - Alexander Graham Bell created the telephone in 1876. The telephone further improved communications and eventually led to the various communications devices used today.

g. Airplane - Brothers Orville and Wilbur Wright created the first airplane in 1903. Within a few decades planes had changed the face of personal and business travel and had dramatically altered warfare.

6. Industries such as textile manufacturing, mining, glass making and agriculture all had undergone changes. For example, prior to the Industrial Revolution, textiles were primarily made of wool and were hand spun. However, with the invention of the spinning wheel and the loom, cotton was produced quicker and eventually replaced wool in the textile field. This dramatically reduced production time and the cost theproduce material. Advances such as these were evident in all industries during this era.

7. At the beginning of the 20th century the golden era of United kingdom, andthey were dominated the international power. Though the economies of Germany and the US were larger, UK was the only leader in global trader. They determined the imported, exported trade within the countries under their colony and huge amount of valuables wereabsorbed from most countries than giving to them. The City of London financed the world trade, and the British currency, the sterling pound and gold were used for global trade.

8. During the First World War the US replaced the UK as the world leader of the international trade, andthey continued to play the key role in the international system after the war. New York replaced London as a financial centre.

9. The World War II completely shaped the technological world that we are now live in. Without this conflict we would not have access to the wide range of technology that we are using today. All the parties who involved to the war have spent vast sums of money on research and development of technology which helped them to win the war.

10. Though the ultimate aim of these researches to find the better ways to destroy the enemy, the invention done during that period have helped to improve lives. The jet engines, computers, navigation systems, microwave ovens and the space technology were rapidly improved during the war period.

11. With the invention of the computer, there were two new business concepts introduced to business process. The supply chain management and Enterprises Resource Planning were introduced during this period and significant share of the business process development were done by these new concepts. The Supply chain management (SCM) is the process that oversight, how materials, information, and finances moving in the business process and how these elements are interlink the, supplier, manufacturer, wholesaler, retailer and the consumer. Supply chain management involves coordinating and integrating these activities within and among companies. Supply chain management helps streamline everything from day-to-day product flows to unexpected natural disasters. With the tools and techniques that Supply chain management offers the ability to diagnose problems properly, work around disruptions and determine how to move products efficiently to those in a crisis situation.

12. Evolving of MRP from the 1960's was design as an inventory management system to manage the demand and ordering. ERP II was developed in 1970's to bring both demand and time phasing of the demand into the planning process. Enterprise resource planning is a method of using computer technology to link various functions such as accounting, inventory control, and human resources across the entire company. ERP is intended to facilitate information sharing, business planning, and decision making on an enterprise in broader basis. So gentlemen I would like to unfold our discussion under the sub topics on production, warehousing, and distribution.

## WAREHOUSING

13. The Warehouse management system is a significant activity of the supply chain in principle it aims to control the movement and storage of material associated transactions, shipping, receiving, storing and issuing.

14. Critical success factors in modern warehouse management are increased visibility through improved tracking and tracing, increased productivity through use of Radio Frequency picking, and increased customer satisfaction through improved accuracy.

1. The application of Radio Frequency Identification (RFID) in modern warehouses has changed method of warehouse operations significantly. Therefore, application of RFID technology in warehouse operation is one of the subject areas which is discussing under the topic of technological breakthroughs and supply chain innovations.

2. RFID is the use of wireless non-contact system that uses radio-frequency electromagnetic fields to transfer data from a tag attached to object, for the purposes of automatic identification and tracking.



Picture 1: Radio-frequency electromagnetic fields

3. **RFID –Mechanism.** With RFID, the Radio frequency portion of the electromagnetic spectrum is used to transmit signals. An RFID system consists of an antenna and a transceiver which read the radio frequency and transfers the information to a processing

device and a transponder which contains the Radio Frequency circuitry and information to be transmitted. The antenna provides the means for the integrated circuit to transmit its information to the reader that converts the radio waves into digital information that can then be passed to the computer's analysis.

### **Functions of RFID**

4. The functions of the RFID are as follows;

a. **Automatic Product Receiving.** The automatic product receiving is one of the significant features of the RFID which denotes the ability to identify the object at the receiving point including description, item code, rack and bin No. This will reduce the congestion in product receiving at the warehouse.

b. **Directed Storing.** Locating inventory is a significant feature in RFID for warehouse management. RFID identifies the items in inbound logistics and they are directed to their respective bin locations.

c. **Automated shipping operations.** The selection of outbound logistics packages, determining of their final destination and forwarding them to the dispatch bay are automatically carried out through RFID technology. This will expedite shipping operations in the warehouse.

d. **Smart Shelves.** The RFID reader can be built in the shelves itself or be installed behind the normal shelves by continuously scanning the RFID tagged items on the shelves. The RFID reader consistently notifies the back end system about the existing items & their improvement. It will also identify items that do not belong on a certain shelf as misplaced items and these movements including where about.

e. **Automatic Self-checkout.** The role of traditional cashier is replaced by a semi-attended customer activated terminal providing customers to process their purchases by assuming the job of the cashier through scanning & making payment/issues for the items through themselves.

f. **Product Recall Management.** RFID technology provides solution for better management of product returns through electronic security marker. An electronic security marker ties the relationship of a particular product to a given sale & then benefits from the elimination of fraudulent products being returned to the warehouse. Customer

returns will add to the inventory file as opposed to depleting it. These returns can be viewed as downstream visibility of negative demand.

g. **Product Freshness Management.** A significant feature of RFID is the ability to measure level of humidity & temperature which are required to be closely monitored & maintained to ensure freshness of perishable items stored in the inventory.

### **Benefitsof RFID**

5. It was identified many benefits which can be enjoyed after the implementation of the RFID in the organization. Those benefits are as follows;

a. **Enhanced Visibility Along the Supply Chain.** The real-time visibility, automatic updates of events in the value chain and unprecedented high level of information increase visibility along with supply chain. With the introduction of the RFID communication and quality of management are enhanced gaining business improvements. Through absolute transparency and real-time automated visibility of the whole supply chain.

b. **Real Time Inventory Information.** RFID can have real-time inventory information that helps to prevent stock outs, locate stock within a store to avoid shrinkage of inventories, and helps to use more effective pricing strategies.

c. **Decreased Labauor Costs.** RFID technology provides practical elimination of the need for human checking of stock. Labor reductions will be realized in the areas of receiving, stocking, issuing, cycle counting and physical counting.

d. **Prevention of Theft, Shrink and Inventory Write Offs.** RFID technology has the potential to alert staff when items are being removed illegally, or when they have been misplaced within the store. These assist in theft reduction and also provide real-time accurate inventory counts automatically.

e. **Enhanced point of sale processing.** Elimination of traditional cashiers and introduction of automatic self checkout will increase the efficiency of point of sale processing in a warehouse.

## **PRODUCTION**

6. Production is one of the core business activities in supply chain management that make what customers requirement. Next five minutes I will explain most significant innovation that effect for the manufacturing process critically, including service oriented organizations all over the world.
7. The market at present is a very competitive as well as highly volatile since it need continuous monitoring. Companies faced three major business realities at present to meet the efficient supply chains.
8. First is 'increasing volatility' in the market, both in geographically and demographically. As per United Nations forecasts, in 2040 another two billion people will enter to the market, mostly in emerging markets. At the same time the generation moved and connected with information and empowered on market decisions. The next driver is how the innovation changes in supply chain process. The 'internet of things' and 'network economy' will be the major drives in supply chain process that move it forward. Thirdly, as a result of increased volatility in the market and growing innovations the global logistics will get more complexity.
9. While addressing those issues businesses must pay more attention on their consumers to delight them rather than satisfying and earn more reducing costs incurred as much as possible. How business can handle this situation favorable manner?

### **Information Technology Solution**

10. The innovation in Information Technology has brought a solution to address this problem that called 'Enterprise Resource Planning' – ERP. The ERP concept can be viewed from a variety of perspectives.
11. First and most obviously in the form of computer software - ERP is a commodity or a product. Second, and fundamentally, ERP can be seen as a development objective that mapping all processes and data of an enterprise into a comprehensive and integrative structure. Third, ERP can be seen as the key element of an infrastructure that delivers a solution to business.
12. Broadly ERP is an integrated information system that built on a centralized database and having a common computing platform in entire organization. ERP systems simply integrate all aspects of a business into one unified database application and interface across the entire business.

## **Requirement of ERP**

13. In traditional way business organizations are structured around departments. Manufacturing, sales and distribution, accounting and finance, human resource and warehousing are some of those functional areas. All departments have to work together if they want to achieve organizational goals. But they fail most of the time to do so and that prevents the achievement of organizational objectives.

14. Worst thing the traditional system is slow motion of information flow. As an example if management required financial position they have to wait at least few weeks until finance account preparation. ERP is a process which is user friendly and that is a matter of clicking of a button.

15. **Characteristics of ERP.** ERP gives wings to the organizations to spread their business 'beyond the horizon' because it provides multi-dimensional flexibility. Especially, it gives multi-currency and multi-lingual facilities. ERP provides complete integration of systems not only across departments but also across companies under the same management. ERP is comprehensive and it supports variety of organizational functions and facilitates wide range of business organizations.

## **Emerging Trends in ERP Market**

16. It is obvious that the future ERP innovations embraced with the innovation of information technology. Future ERP systems will consist with followings;

a. **Cloud based service providers instead of on-premises software.** The vendor or the consultant keeps the software at their servers instead of installing it in the company's premises. This will reduce infrastructure costs as well as ERP implementation costs. The hybrid cloud gives businesses greater flexibility and more data deployment options.

b. **Mobile Customer Relation Management.** Cloud based technology enables the mobile to continue to connect with cloud systems. As employees spend less time in the office, the mobile facilities ensure that they are connected wherever they are, and are able to communicate and collaborate with colleagues back at the office.

31. In future business organizations ERP will be a necessity than a facility for any organization in the future as business organizations will have to move forward with the technological enhancements.

## **DISTRIBUTION**

32. Distribution is the most important affair in supply chain and having placed a proper mechanism to ensure flow of raw material and finished products from business to end-user increases the cutting edge advantage in competitive business world. The mode of distribution is equally important to consider in order ensuring distribution of right product, in right quality, in right quantity to the right customer. However, failure in success of making customers' expectations are always adversely affecting for any organization in multi facet. Therefore the managers are very keen on this segment understanding the importance.

33. Also around one third to two thirds of the expenses of enterprises' logistics costs are spent on transportation. The cost of transportation, on average, accounted for 6.5% of market revenue and 44% of logistics costs as per the annual report in 2014 of National Chamber of Commerce. It shows transportation is the highest cost, which occupies 29.4% of logistics costs and then in order by inventory, warehousing cost, packing cost, management cost, movement cost and ordering cost. The ratio is almost one-third of the total logistics costs. The transportation cost includes the means of transportation, corridors, containers, pallets, terminals, labors, and time. This figure signifies not only the cost structure of logistics systems but also the importance order in improvement processing. It occupies an important ratio in logistics activities. The improvement of the item of higher operation costs can get better effects. Hence, logistics managers must comprehend transport system operation thoroughly.

34. Therefore, the present days business organizations are much conscious than ever to scale down the transportation cost in order to reduce the impact from transportation to total net profit. The technology plays a significance role in this aspect where it tries to introduce new innovations and maximize efficiency.

### **The Walmart Advance Vehicle Concept**

35. The Walmart Advanced Vehicle Experience concept truck is the result of their innovation. This prototype combines aerodynamics, micro turbine-hybrid power truck, electrification, advanced control systems, and cutting edge materials like carbon fiber all in one vehicle.



Picture 2: Walmart Advanced Vehicle

36. They are having approximately 6,000 trucks in the U.S. log millions of miles every year, delivering products to thousands of locations across the country. So when it comes to sustainability and fleet efficiency, the goal is simple: deliver more while driving fewer miles. This goal is the driving principle behind the Walmart commitment to double fleet efficiency by the end of 2015. Since 2007, Walmart has been delivered 830 million more cases while driving 300 million fewer miles. That is an improvement of 84.2% over their 2005 baseline.

37. **DHL's Fleet of Green Delivery Vehicles**. Cincinnati-based First Vehicle Services (FVS) will oversee the maintenance of DHL's fleet of "green" delivery vehicles, including 30 battery-powered electric vans and 50 hybrid trucks. The new vehicles are shown to reduce carbon emissions by more than 50 percent. Since 1993, FVS has maintained more than 860 vehicles in DHL's fleet. FVS's fleet management solutions are custom-tailored to meet customer needs. The company works to design maintenance solutions that significantly reduce costs while increasing fleet effectiveness.



Picture 3: DHL's Fleet of Green Delivery Vehicles

### **Internet Technology**

38. Internet technology is widely used in the transportation industry to share information and track cargoes. Tracking cargo is an important way to maintain control over distribution. Internet information is normally timely, up-to-date and easy to obtain. Several transportation companies make Internet-based tracking mandatory, and some shippers provide tracking information on their own Web sites.

39. The Internet permits direct arrangement of cargo and reports shipment status in real time. For logistics management, the Internet provides information which allows shippers to plan, implement and monitor a more efficient and cost-effective transportation system.

40. **Global Position System (GPS)**. One of the most important tracking technologies, now used in transportation worldwide, is the global positioning system (GPS), which integrates satellite, communication and computer technologies. The system is used largely in air traffic control, in tracking vehicles and cargo, and navigating ships.

### **Electronic Data Interchange (EDI)**

41. Electronic Data Interchange (EDI) is inter-company, computer-to-computer communication of data, which can automate and organize documentation associated with the transportation industry. This program was created in the 1970s, but developed and popularized during the 1990s. It permits transferring the documents such as bills of lading, shipment status,

invoices, delivery notifications and credit notes in standardized electronic format. EDI allows carriers to improve their performance, enabling them to offer seamless service, accurate and timely billing and to analyze their performance regarding mileage, terminal activity, costs and pricing processes.

42. The world is moving fast with the technology and the business also catching up the new innovations to ease up the processes. This will never come to an end and day by day the systems are updating. This provides an insight for us to re-think about our systems and adoption them in order to achieve the cutting edge advantage thereby move forward with the dynamic cyber environment.

## APPLICATIONS TO SRI LANKA NAVY

43. We have listened for three informative speeches about the topic of technological breakthrough and some of its innovation in supply chain management. Today the world is growing in the sphere of new technology. Therefore we have to have a self-appraisal about our services about extent we utilized this technology and how best we can utilize them to develop our own systems.

44. Today Navy's workforce is exceeding 50000 and divided to 7 naval areas for administration convenience. The daily operation cost is approximately 13 million showing the magnitude of the operation in Sri Lanka Navy. The operations of the organization are supported by the logistics Department and it involves several supply chain components such as budgeting, procurement, warehousing and distribution, victualing and clothing, pay and pension and hospitality services.

45. Currently Sri Lanka Navy maintaining warehouses in seven naval areas. These warehousing functioning independently and rarely share the information about the stock availability with other areas. The reason is the limited funds allocate to each area where they have to manage within the allocated funds and the difficulties to get down the items are discouraging such sharing. Owing to separate functioning the similar requirement are purchasing individually by 7 areas and the advantage of enjoying bulk purchasing has been eliminated. Because of this the Navy as a whole losing the opportunity to save money and also need huge workforce to execute the job. Since it is high time to re-think about having place a proper centralized bulk procurement system to gain the advantage of saving of time and the cost.

46. Central ware house to collect and distribute bulk purchases may be located close to Colombo as the most of supply source are centered in Colombo. The other seven areas also have the equal advantage in respect of the distance to Colombo where they all can reach Colombo within 5-8 hours. This will enable to have a proper warehousing with the technology as explained in speech on warehousing and manufacturing. Having a fully pledged warehousing should be back by a strong supply sources to provide the expected results.

47. Therefore the existing Integrated Logistics Management system should be further improved to facilitate E- Procurement thereby to maximize the efficiency and effectiveness in getting down the items required. This will enable the seven areas to connect on line and order their requirement.

48. The E - procurement will bring the advantages such as;

- a. Increase responding time of supplier.
- b. Create more completing among supplier to respond to the bid.
- c. Reduced the lead time.
- d. Make paperless environment.

49. **Transportation.** The most of the draw backs in existing transport system are also result of improper warehousing system. Because of the decentralization of warehousing, the all 7 areas are happened to maintain a huge transport fleet incurring lucrative amount of cost. The trucks are daily moving in to Colombo from 7 areas and collecting the items. The cost involvement for this is very high. Therefore, it is enabling Navy to acquire new vehicles to cater bulk transportation to delivery material/goods for the relevant areas by developing ERP.

### **Human Resource Management (HRM)**

50. The human resource is playing a major role in entire supply chain management. The existing manual procedure to manage approximately 55000 man power including 3500 officers is a difficult operation. This operation can be ease up by introducing an efficient ERP solution for entire Navy and will have the opportunity to share important information with the internal and external customers of Navy. The introducing an electronic identity card to reveal all the details in respect of each individual will enhance the availability of information.

51. This will enable to achieve the advantage on the areas of personal check in and out, facilitate better drafting action, messing, pay matters, uniform issuing and Medicine.

### **Wardroom Messing**

52. The wardroom messing is another one of major area to be streamlined in internal supply chain management. The entire process in wardroom messing involves complex activities, such as menu costing, meal marking for officers, calculation of expenses for individual officer and preparing final accounts.

53. By introducing an electronic card will be benefitted for wardroom to integrate the process in wardroom ERP and officers can link on to the system at any time. The officers' room can be link to the wardroom ERP by way of having place an electronic interface at each cabin which will enable officers to be connected online. This will brings the following advantages;

- a. Check in check out.
- b. Meal in and out.
- c. Ordering of meals including preferences.
- d. Credit or debt position of individual accounts.

54. Further there should be smart card system for entire accommodations in particular wardroom which is helpful to reduce electricity cost, water bill, maintenance of all lodging.

55. **Food Preparation.** The Navy is daily catering to feed entire workforce internally. The existing cooking arrangements are very conventional and need to be improved. The kitchens can be introduced modern cooking gears and enhance the productivity in kitchens. This will motivate the staff and also enhance the quality of food.

### **Innovation**

56. Naval electrical, marine engineers Research and Development unit were instrumental in developing many systems for the betterment of navy particularly during war time.

57. Electrical engineers managed to develop integrated maritime surveillance system when the principal manufacture refused to provide the technology to SLN. Similarly SLN electrical engineers managed to use private microwave backbone covering whole the island and also able to generate real time radar pictures about deployment of the ships. In addition to that SLN has innovated several new things such as;

- a. Rapid action boat concept.
- b. 30 mm GCM mount MBRL 08/16 Gun.
- c. 30 mm Bushmaster Gun.
- d. Admiral barge

## CONCLUSION

58. However, this is required to carry out with a radical re-thinking to see a change in the existing systems. Because some processes themselves are having so many deficiencies and required to do a complete process reengineering. Also the task of adopting new technology is not as easy as thinking and it involves lucrative amount of money, resources and dedication as well.

59. Therefore, this process should carry out as a gradual development. It should convince the higher authority about the necessity and importance. The top management's support is very much crucial in this respect. The necessity of the change is inevitable and delaying to take the timely decision will further cost to the Navy.

60. Therefore, Navy should more focus on the electronically equipped solutions as we have mainly concentrated the welfare matters after the war rather than thinking of process developments in order to make ready it for next generation.