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Role of ERP in e-commerce supply chain management system

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Abstract
E-business is concerned with the use of the Internet to link companies with their suppliers, customers and other trading partners. The modern ERP systems are fully integrated with e-commerce supply chain solutions like e-procurement, manufacturing, distribution, shipping, supplier and buyer-oriented marketplaces and exchanges etc. SCM is a powerful strategic function capable of significantly improving customer value propositions by the reengineering of intranet and internet-enabled collaborative channel partnerships. Latest developments in information technology have boosted the e-Supply Chain Management concept to newer dimensions. However, these integrated ERP systems still have considerable implementation and utilization issues including complexity, infrastructures, high cost, long time to recover investments, and being too expensive for small as well as middle-size companies. The topic presents the framework of overcoming these issues and increasing value in supply chain e-commerce development and ERP systems. This paper conducts an extensive literature review to identify the latest trends in e-SCM. It also attempts to study some of the issues associated with e-SCM along with their solutions and practices.

Keywords: e-supply chain management, erp, reengineering, information technology, intranet, internet, e-commerce

Introduction

The roots of Enterprise Resource Planning (ERP) systems go back to Material Requirement Planning (MRP) systems, which were developed in the 1960s and 1970s, making it possible for the first time to plan manufacturing based on future demand rather than on historical data (Kennerly, 2001) [8]. In contrast to MRP, whose functionality was limited to procurement, production and manufacturing, ERP is cross functional, multifunctional and multidimensional, delivering real time data from only one centralized database. It is integrates and linking all departments throughout the entire organization. The different vendors, referred to as best of breed implementations, like those from the so called "big five" SAP, Oracle, PeopleSoft, JDE, Baan, which control approximately 70 percent of the ERP market – can be used jointly together (Light *et al*., 2001; Mabert *et al*., 2001) [9].

Supply chain module of ERP handles all the store activities of issues, dispatches, receipts and quality control. Whether you are a manufacturer, wholesaler or retailer, management of your inventory is critical to controlling your costs and ensuring the smooth operation of your business. Stock management and valuation activities, which form the backbone of any organization generally, take a lot of time and resources. The lot wise stock of each item is maintained and various computerized information reports are provided for tracking stock movement.

O'Leary defined ERP system as "computer-based systems designed to process an organization's transactions and facilitate integrated and real-time planning, production, and customer response" (O'Leary, 2000, p.27) [11]. Bingi *et al*., 1999 define, ERP system as a packaged business solution that is designed to automate and integrate business processes, share common data and practices across the enterprise and provide access to information in a real time environment. Rosemann (1999) [12] described the ERP system as packaged but customizable software application, which manage data from various organizational activities and provide a fully integrated solution to major organizational data management problems. It provides for both the core administrative functions, such as human resource management and accounting, as well as integrated modules which can be selected to support key business processes, such as warehousing, production and client management.

There are many different systems in large organizations, including planning, procurement, manufacturing, distribution, shipping, and accounting. Enterprise resource planning (ERP) is a system that integrates all of these different functions into a single system, and designed to serve the needs of each different department within the organization. ERP is more of a methodology than a part of software, even though it does integrate several software applications, brought together under a single, integrated interface. ERP Software gives you real time information on current stock levels and values including stock on order, raw materials, work in progress and finished goods. ERP inventory module covers all stock related functions of an organization. Inventory control module is a tool which can help you maintain the appropriate level of stock in a warehouse and facilitates recording of data in the inventory department / warehouse. The activities of supply chain of ERP involves in identifying inventory requirements, setting targets, receipt of goods, delivery of goods, maintenance of material in the stock sections, classifying all the materials, issuing of materials to the manufacturing department, rejections from the suppliers are recorded with full details. It also provides replenishment techniques and options, monitoring item usages, reconciling the inventory balances, and reporting inventory status.

The key functions in this module enable you to keep correct information of current level of stock by evidencing inputs and outputs of different resources in or out of the warehouse. Also, history of each resource on the stock is available, enabling you to identify business trends and plan orders. The supply chain

module of ERP provides a high degree of flexibility for handling complex storage needs, and assures continuous update of warehouse inventory through multiple inventory methods and different types of auditing. The module offers advanced warehousing features such as modification, balancing, transfer, and reverse operations. Integration of inventory control module with sales, purchase, finance modules allows ERP systems to generate vigilant executive level reports.

The high level of integration found within the ERP system provides end-users with the highest level of visibility into materials transactions within their enterprise, and assures the accuracy of the data relating to the inventory within the warehouse. Inventory analysis analyzes inventory items by category, supplier, product ID, date, etc. The analysis function selects, sorts, and summarizes these transactions and presents them in numeric and graphic forms. It supports both pre-defined and ad hoc queries. All materials input and output transactions are fully automated due to the seamless integration with other associated modules within the system. This also enables efficient, prompt and trouble-free inventory transactions within enterprises. The Inventory module automatically tracks inventory balances, serial numbers, and lots, and product line information. The module's sophisticated tracking functionality ensures that you always know your inventory costs, serial numbers and locations. It also control offers an extensive array of reports, enabling you to easily analyze and control your inventory. All balances are updated in real time for up-to-the-minute, on-screen access. Inventory Control integrates with Accounts Payable, Purchase Orders, Order Entry, and Accounts Receivable to deliver automated up-to-the-minute status of current balance, inventory value, period-to-date gross margin, billings, receipts, discounts, and cost of goods sold.

Supply Chain Management (SCM)

Supply chain management is the process of overlooking and making the necessary arrangements for the sourcing, procurement, conversion, logistics and management of the supply chain. Those working in supply chain management must also collaborate and coordinate the movement of goods with channel partners. These might include anyone from customers to suppliers, from third party providers of specialized services to intermediaries in the supply chain.

Supply chain management was a term invented by Keith Oliver, a consultant belonging to the firm Booz Allen Hamilton, in the year 1982, to describe the overall process of planning, implementing, and controlling what goes on at the supply chain in order to satisfy customers' needs in a quick, efficient manner. Improvement of supply chain is one of the leading edge for improving productivity and supply chain visibility is the most important challenge faced by supply chain organizations. This is more relevant in the perspective of retail, consumer goods and electronics industries where organizations are challenged by distributed operations, high demand volatility and rapid product appraisal.

A properly implemented supply chain solution enables an organization to quickly respond to supply chain abnormality, and provides following benefits:

1. Better order promising through increased work in progress and end item inventory visibility.
2. Closed loop planning and execution, resulting increased factory throughput.
3. Improving extended supply chain visibility and better collaboration encompassing vendors, customers, distributors, transporters and even competitors.
4. Quickly sense and respond to any changes in the marketplace.
5. Accurately anticipate customer demand and respond quickly and efficiently.

Customer Satisfaction

Customer satisfaction is the best reward any business can get. Every business needs to stay on the top of the competition to reach this goal. You can compete successfully by giving your employees important sources of information to keep your customers satisfied. In your business you would want to make sure that your products and services meet the customer's expectations. You should also be able to meet their demands and supplies efficiently. The customers should be able to receive the products or services when and where they want it for the present and future. A business will need a lot of analytical data to determine all these possibilities and act accordingly. The supply chain module of ERP helps a business track all this crucial information, and it also helps the business serve the customers and ensure customer satisfaction. This is also a way to ensure that the customer is always provided with the latest updates on products via interfaces with the firm's production and distribution points. Effective customer service plans entail the making and meeting of goals that will satisfy both the company and the customer; making and maintaining relationships with the customer; and ensure that a positive feeling exists for both the customers and the company's workers.

SCM Tools

Today the business landscape is globalizing. The Supply Chain Management Software effectively integrates performance management and supply chain management. It meets all the demands for the modern day business. An efficient process like supply chain management is intelligent and can take charge of the business and steer it towards profits. You can connect your office virtually to hundreds of different geographical locations, time zones and other businesses globally. The reputed ERP vendors such as SAP, Oracle, and Microsoft are leading supplier of ERP-SCM solutions for organizations. The product suite offered by theses solution providers broadly comprise of following components:

1. Provides, in synchronization with supply chain demand projections, multi site production schedules in most efficient manner.
2. Provides tools to integrate demand and supply plan.
3. Collaborative planning and scheduling.
4. It provides various forecasting algorithm with lifecycle modeling ability which gives an accurate understanding of cycles of an item, so as to minimize set up time, reduce cycle time and maximize throughput.
5. Web based private trade exchange.
6. It facilitates information integration and tracking in real time in respect of several aspects such as delivery schedules, delivery information, inventory, capacity planning, quotation, quality and credit.
7. Monitoring of incoming goods through GPS tracking.

8. Provides strong scenario based tools for sales and operational planning, where any change in supply chain, such as breakdown of a manufacturing capacity, is accounted for in real time.

Features of Supply chain Management

SCM module of ERP is significant importance in a highly integrated supply chain and the module facilitates accomplishment of organizational objectives including cost efficiency and enhanced customer loyalty by rendering superior visibility and streamlined processes. The Inventory management module offers effective features to minimize inventory costs and to optimize storage needs in line with the requirements in an organization. Efficient inventory management should be able to quickly respond to customer requirements; at the same time should be flexible enough to undertake any corrections when required, and do the so without affecting operational efficiencies. Features of ERP Software's Inventory Management include the following:

Maintaining Inventory Items

- Online status of item quantity in terms of on-hand, available, reserved, ordered, to order, rejected, defective and rework-able quantities. The inventory software tracks serial numbers and lot items when stored, ordered, and shipped.
- Analysis which help in maintaining optimum stock levels.
- Tracks and reports on user-defined inventory product lines.
- Physical verification of stock.
- Material Requisition from different requirement areas.
- Stock transfer – receipts from other warehouse.
- Purchasing and subcontracting.
- Inventory Items, Items at Location, and Items by Supplier have an Active / Inactive status indicator.
- Set up bar codes for Items, Location, Lot No, Serial No, Stores, and Bin.
- Support both numeric and alpha-numeric bar codes.
- Update item ID data in Inventory Control, Accounts Receivable, and Sales Order when you scan item bar codes online.
- Integrates radio-frequency and bar-coding warehouse automation technology.
- Inventory is automatically updated in the inventory software from sales generated in the organization.
- Receiving material against sales order processing, material requirement, subcontracting, gate pass and production requisition.
- Supports different settings at the item level such as item type (asset, expense, and inventory), taxable item, item class, miscellaneous code, commodity code, and more.
- Allows multiple suppliers for the same inventory item.
- Landed Rate of Items.
- Consolidation of all warehouses.
- Multiple levels of classification of items.
- Quality Control based on QC parameters.
- Handling Material Rejections.
- Rejected Material dispatch to subcontractors.
- Gate pass – returnable/non returnable.
- Reallocation of re-workable stock.
- Supports inventory software data entry in multiple windows at the same time, which allows simultaneous processing of receipts and transfers.
- ABC inventory software analysis allows categorization of inventory items according to their overall performance or value.
- Tracks virtually unlimited inventory locations and multiple warehouses/branches/regional offices. Tracks costs at inventory locations utilizing in-depth inventory control software.
- Handling of non-stock low value items like stationery.
- Linking of PO to Invoice.

Item Forecasting

- Item Forecasting Wizard can project the demand for an item individually and by group, and estimate a new order point and order quantity.
- Store max/min quantities and use in recommended purchase order.

Pricing and Cost Valuation

- Multiple price schedules can be created from the inventory software for items based on cost markup, price discount, or fixed price methods, with options for rupees amounts of percentages.
- Item cost is maintained by location; the average, standard, and last receipt cost for each item is stored at each location.
- Performs rupees or percentage mass cost and price changes to one or more groups of inventory items.
- Supports LIFO, FIFO, average weighted, and standard cost inventory valuation methods.
- Inventory price group function provides an easy-to-use inventory software template for complex pricing schedules to be rapidly applied to multiple inventory items.

Reporting

- The complete inventory software real-time Business Status Report provides immediate status of current balance, inventory value, billings, receipts, discounts, period-to-date gross margin, and cost of goods sold when used with Accounts Payable, Purchase Orders, Order Entry, and Accounts Receivable.
- The inventory control software provides inventory sales/usage history complete with graphs.
- More user-defined filters available for Inventory Control reports.

Integration of ERP and E-commerce

The idea of combining B2B e-commerce applications and ERP systems is tremendously deep-rooted into the requirements of fully integrating and automating the electronic enterprises' flows, making them more fast, effective, and efficient. For example, a B2B storefront, where the company sells its products online, represents a "front-office" of the company. However, the requirements of timely execution of the sales orders need their quick processing into the master scheduling, material requirements planning, distribution planning, and, quick passage of information to the organization's vendors. This needs an integration of the "front-office" and the ERP "back-office of the company." On the other side, the present e-commerce solutions for purchasing and outsourcing provide

online vendors catalogs, immediate response, and better supplier-customer relationships. However, the e-procurement decisions are related to the overall purchasing systems in the company, supplier selection and scheduling processes, which are components of ERP. The integration of e-commerce and ERP takes place in different areas of supply chain management including its networking, planning, organizing, coordination, controlling and execution. The modern ERP systems could offer the following e-commerce supply chain management solutions:

- Enables buyers and sellers to work together on demand and order forecasting, and on the dynamic exchange of information.
- Integrates Web-based buying processes, including procurement, automated replenishment, and multiple supplier support.
- Widen the efficiencies and benefits of networked supply chain management to every member of the organization.
- E-marketplace infrastructure that enables to extend the supply chain system across enterprise boundaries by linking suppliers, partners, and customers.
- Monitors on key indicators and objectives of supply chain performance, including costs and assets across the supply chain system.
- Manages supply chains throughout all stages of the operational process - even across enterprise boundaries.
- Line up supply chain infrastructures to changing market conditions, such as new product launches and new customer segments that enable to reduce time to value.
- Examines every stage in the supply chain system, from price quotation to the moment the product arrives at the customer site - including alerts when things go wrong.

The explained solutions that integrate ERP and e-commerce supply chain management system are designed to give the benefits to all essentials of supply chain. For the customers, this integration (ERP and e-commerce supply chain) benefits might be the following:

- Allow permanent access to the enterprise selling capabilities.
- Lesser cost for the online purchases.
- Access complete and correct order status information.
- Provide fast delivery times, resulting in more customer satisfaction.
- Transform from a supply-centric to a customer-centric demand chain.

For the enterprise, the main relationship in a supply chain, the e-commerce integration with ERP systems could offer the following benefits:

- Increase planning and organizing accuracy and real-time location of products around the world.
- Achieve more rapidly responsiveness to unanticipated demands and also improving customer satisfaction and service.
- Reduce inventories and optimum utilization of recourses.
- Rapidly and easily evaluate suppliers on an overall basis.
- Match supply and demand through integrated and collective planning tools.
- Quick respond to changing customer requirements quickly and efficiently.

For the vendors, the value proposition in the integrated ERP and e-commerce supply chain might mean:

- Collaboration with customers on forecasting, market requirements, new product development, and delivery schedules.
- Fast response to unexpected market demands.
- Improved capabilities for planning, organizing, coordinating and scheduling supplier production.

Complexity in ERP and E-commerce Integration

Having identifiable the importance and potential benefits of integrating the ERP systems with e-commerce supply chain applications, we require to recognize that the implementation of such solutions still did not actually take place in the majority of organizations. Statistics show that only 18 to 20% of organizations, that primarily utilized ERP systems, have already implemented or are implementing integrated ERP and e-commerce solutions. Most of the businesses with ERP systems still either do not have any e-commerce supply chain systems, or have a preference to utilize a non-ERP vendor organization for their e-commerce and supply chain solutions. The analysis of the ERP and e-commerce integration permitted to bunch the issues related to this implementation into these main groups:

- Supply chain issues,
- E-commerce related issues,
- Infrastructure related issues, and
- ERP-related issues.

Web-enabled ERP systems and their implementation still remain very complex, time, resources and cost consuming. These systems require plenty testing, parallel implementation, and trained experts. The cost of advancement an existing ERP system to a web enabled one might be, depending of the organization size. Therefore, in many cases the organizations look for cheaper e-commerce solutions for their B2B seller or buyer-oriented marketplaces, and then apply other system integration software to bridge the e-commerce applications with the presently or existing back-office systems. This situation, being typically less costly, does not provide really one-system integration of supply chain management solutions and leads to the persistence of the old practice of managing customers, manufacturing, processes and suppliers separately. In addition, the existing ERP systems are still too expensive by the great majority of small and some mid-size organizations.

Enhancing Implementation of Integrated Solutions

A successful integration effort requires collaboration between buyers and suppliers, as well as teaming up on the development of new products, sharing information, and developing common systems. Information must flow continually in order to operate a successful integrated supply chain. When it works effectively, this helps everyone attain the best product flows.

The study of the implementation of web-enabled ERP systems and their integration with B2B e-commerce solutions allowed recommending a number of directions that would definitely affect the future development and proliferation of that integration.

Implementing a process-based approach to SCM involves maintaining quality customer relationship and customer service management, order fulfillment, demand management, returns

management, the development and marketing of products, supplier relationship management, as well as Manufacturing Flow Management.

The main idea of the projected enhancement is the simplification of the integrated solutions, minimizing their cost and future increase of hosting applications. The main highlights of these developments are as following:

- Development and implementation of simplified and enhanced web-enabled ERP and e-commerce integrated systems for small and middle-size organizations.
- Improving existing ERP and e-commerce solutions with more variety and flexibility for accommodating different customer requirements.

Conclusion

The supply chain module of ERP provides a high degree of flexibility for handling complex storage needs, and assures continuous update of warehouse inventory through multiple inventory methods and different types of auditing. ERP and SCM systems offer different benefits to an organization in terms of capabilities and functionalities. Given the intra-organizational and inter-organizational advantages offered by ERP and SCM respectively, integration of both systems will provide a company with substantial leverage over competitors. The high level of integration found within the ERP system provides end-users with the highest level of visibility into materials transactions within their enterprise, and assures the accuracy of the data relating to the inventory within the warehouse. The positive benefits of integrating the internet into supply chain management that allows supply chain activities to be carried out in a synchronized, instantaneous manner, facilitating maximum supply chain performance and generally be more important than the risks and associated costs, and firms who have completed such integration hold a current competitive advantage over those that have not. The e-supply chain management tool that can be used to improve customer satisfaction, reduce costs, smooth production flows and shorten cycle times. The SCM module's sophisticated tracking functionality ensures that you always know your inventory costs, serial numbers and locations. It also control offers an extensive array of reports, enabling you to easily analyze and control your inventory. All balances are updated in real time for up-to-the-minute, on-screen access. Inventory Control integrates with Accounts Payable, Purchase Orders, Order Entry, and Accounts Receivable to deliver automated up-to-the-minute status of current balance, inventory value, period-to-date gross margin, billings, receipts, discounts, and cost of goods sold.

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