Abstract

Changes in business world lead to emergence of different theories and approaches in sectors and concepts of business including supply and purchase. These approaches result from thoughts and lead to application of new concepts in production and business as well as supply and purchase. For example, application of information and communication technologies is the main cause for emergence of electronic data interchange (EDI) and smart systems in supply and purchase and concepts of lean thinking introduced lean supply approach. These approaches represent evolution of supply since beginning up to now, some which have been replaced by others. Current work aims at identifying and introducing novel approaches in purchase systems. Some theories, novel systems and approaches in relation with supply, purchase and procurement are reviewed in the following and their characteristics are described. In addition, some approaches such as e-commerce, e-business, etc. are also identified and introduced which have been created in recent decades in the field.

Keywords: Management Systems, electronic data interchange, Supply chain, supplier relationship management,
Quick access to the technology of the day
Smart acquisition system is supported and implemented with the collaboration of Logistic Department and Procurement Office of the UK Ministry of Defense. Acquisition in this system is considered as a combination of Requirement, Procurement, Support, and Disposal processes. The system acts well through group work, focus on Life cycle approach and use of the best experiences and thus it would moves toward supplying items and equipment in a quicker, cheaper and better way (Ghaffari Touran, 2008 a).

2. Direct Vendor Delivery (DVD)

In Direct Vendor Delivery (DVD), the supplier directly meets needs of the customer. DVD reduces needs for management of inventories, warehousing, material transportation and transportation shipping systems. DVD increased availability of the product and allows inventories in the warehouse get less outdated and old in a lower costs (preventing from expiring the product date). Reduction in logistic response time and infrastructure costs is goal of DVD. Direct Vendor Delivery reduces unnecessary transportation, storage and delivery costs. Direct Vendor Delivery is practically used in long-term contracts with suppliers on fixed demanded goods (Ghaffari Touran, 2008 a).

DVD has been used for about 15 years in logistics. U.S. Army uses DVD for goods and items which are not needed to be stored in supply depots. Following purposes are often pursued in implementation of DVD in logistic literature:

1. Reducing warehouses and infrastructures
2. Improving response time to customers
3. Reducing production delays
4. Reducing administrative costs for accepting orders
5. Employ less depot space and storage (Ghaffari Touran, 2008 a).

3. Change in Purchase Strategies

Change in purchase strategies motivates finding new ways for more streamlining of logistics process and reducing ownership and logistic process implementation costs. Wide range of activities can be included in DVD which is done by personnel, such as:

- determining and declaring the needs
- Responding to requests sent from the sectors
- Ordering and storing items with long supply time
- Storing and shipping goods in needed time based on Just In Time (JIT) thinking (Ghaffari Touran, 2008 a).

4. Practical Application

US Army uses Standard Central Air Data Computer (SCADC) on aircrafts model F-14, E-2, C-2, S-3, and EA-6B to convert weather data in flight to data needed for flight control and shot navigation. US Army concluded a 10-year contract with a contractor for provision of facilities, equipment warranty, inventory management, implementation of technological change and sending equipment within 48 h via DVD. Contractor of this contract used electronic data interchange and web-based technologies well to be aware of army need in different situations as well as communicating with users. This contract provided 7.25 million dollars saving for the army during first six months of implementation (Ghaffari Touran, 2008 a).

5. Quick Response (QR)

Quick response (QR) includes a state of accountability and responsibility which enables the organization to deliver a wide range of products and services in appropriate amount, optimal quality in specified time and location to the customer or consumer. QR includes a collection of strategy, structure, culture and administrative
procedures for integrating enterprise to quick data transfer and profitable exchange of services and products in the enterprise.
QR is in fact a participatory attempt between sellers and suppliers to improve accountability and speed of warehouses to meet needs of the customers.
QR originated from clothing industries in US in early 1980s (Ghaffari Touran, 2008 a).

6. Continuous Replenishment (CR)

Continuous Replenishment (CR) includes strategies which are referred in demand-centered approach to demand chain management. CR, which is also called Vendor Managed Inventory (VMI), is actually a modification on QR which eliminates need for reorder from seller to supplier. The aim of CR is providing effective and flexible relationship in the chain through which seller’s warehouse is continuously replenished in needed time by the supplier in a continuous manner (Ghaffari Touran, 2008 a).

7. Collaborative Commerce

Collaborative commerce is one of the new business methods in which rapid data transfer occurs among members of the chain along with their participation in each other’s affairs. In collaborative commerce, all chain members participate in all chain processes including design, production, distribution, etc. in addition to sharing information.

For example, the producer uses information of customers, suppliers and engineers in this type of commerce to determine level of its products. As observed in Figure 1.3, information of all chain members are shared in a extranet network or a private network with specifying access levels in collaborative commerce (Ghaffari Touran, 2008 a).

![Collaborative commerce structure](Laudon and Laudon, 2003)
8. Electronic Business

Electronic business in its simplest way includes directing and navigating works through internet bed (Ghaffari Touran, 2008 a).

Electronic business as one of ICT subsets has experienced high growth within recent decade, so that policy approach of most commercial enterprises and e-business application to enter global markets and attracting new customers is in this direction (Gharbali Moghadam and Eghdami, 2008 a).

9. Electronic Business Components

Followings are requirements of electronic business:
1. Enterprise Resource Planning (ERP)
2. Customer Relationship management (CRM)
3. Supply Chain Management (SCM)
4. Business Intelligence (BI)
5. Electronic Commerce (EC) (Fathian and Mahdavinour, 2010)

10. Electronic Business Applications

The main applications of electronic business are classified into three different categories:
1. Internal systems of business
2. Organizational communications and cooperation
3. Electronic commerce – enterprise and enterprise – customer

11. Electronic Commerce

Development of IT application in business led to emergence of a new concept known as electronic commerce. Electronic commerce is implementation and coordination of the main processes of industrial and economic organizations through IT application.

Elimination of local and temporal limitations, access to global markets, elimination of operational time and cost, streamlining structure of organizations, increased flexibility in the organizations and facilitating commercial process are advantages of electronic commerce in the organizations.

The major advantage which distinguishes systems on electronic commerce fields from other operational and island systems is the concept of integration in them. These systems provide considerable time and costs saving by integrating processes and data in the organizations. Access to timely data, facilitating processes and eliminating obstacles and operational bottlenecks in the organizations are advantages of these systems. Enterprise Resource Planning (ERP) and Supply Chain Management systems are the main types of integrated systems (Brown et al., 1996).

The main feature of electronic commerce in the marketing view is communicating between organization or individual and the whole addresses and adopting products and services to individual needs. Intense competition, offering a variety of products and services and consequently, reduced costs and increased customer satisfaction are its outcomes. The important point which should be considered is that technology and technical knowledge is not proposed in electronic commerce, rather the purpose is identifying new models of commerce and communications present in the electronic environment, which includes a collection of telecommunications technology, data processing and storage in relation to the markets, organizations, customers, intermediaries and electronic payment system (Ruhi Isalo and Yazdani, 2008).

12. Supplier Relationship Management (SRM)

Increased competition and changes in market and business environment change ways of supplying goods and relationship between buyers and suppliers. Increasing relationship with suppliers and developing collaborative
and sustainable relationship with them is necessary in the new conditions to reduce costs and increase flexibility toward the market changes. To this end, some great software companies caused significant improvements in this regard by providing comprehensive and effective solutions known as Supplier Relationship Management (SRM). Of course, emergence of such systems was through increased dependency on the contractors and suppliers in the organizations. In order to increase the profit, the companies should be able to select the suitable supplier in the minimum time, increase strategic relationship with suppliers, and interact with them effectively. Supplier Relationship Management systems provide tools through which it is possible to develop interactive, wide and strategic relationships with suppliers. These systems manage strategic procurement within organizations and between several organizations.

Suppliers can influence significantly on the performance of companies in price, quality, technology and delivery categories. Supplier Relationship Management (SRM) focus is on the whole supply chain from preparing raw material to final consumer, so that increased customer satisfaction and reduced costs is provided. Thus, approach of supply chain optimization based on suppliers was considered in this work. Instead of winner- loser relationship, close relationship and mutual trust of win- win type has replaced previous communications and the majority of activities are focused on eliminating poor performance of suppliers and improvement of supplier performance by the purchaser, and purchase process has changed to supplier relationship management, the number of which has been reduced. Overall, supplier relationship management seeks for providing an appropriate framework for ongoing evaluation, performance development and selection of appropriate suppliers (Ghaffari Touran, 2008 a).

Characteristics of Supplier Relationship Management Systems

SRM systems possess following capabilities:
- Communication: improvement and automation of communication between buyers and suppliers. Providing accurate information to the qualified personnel helps improvement of decision making capabilities.
- Planning: improved comprehensiveness of purchase program and basic supplier selection based on risk of supplier, supplier performance, and profitability.
- Sourcing: Provides the capabilities of supplier selection, contracting based on previous and current project information.
- Procurement: online management of RFQ and RFP processes, evaluating responses of suppliers and providing quick feedbacks
- Cooperation: creating information sharing capability between suppliers and buyers simultaneously. This information includes all life cycle of the products from design to engineering and production and delivery.
- Data Mining: providing accurate information on suppliers with perfect details.

Trends of suppliers can be analyzed using this capability, their performance can be ranked and saving and cost reduction areas can be specified (Ghaffari Touran, 2008 a).

13. Advantages of Supplier Relationship Management System

- Maintaining the value and cost savings
- Greater control over procurement processes (the processes that can be analyzed in terms of the rules and regulation and adjustment of the contract)
- previewing critical management information
- Optimization of procurement transaction costs (Ghaffari Touran, 2008 a).

14. Electronic Marketplace

Electronic marketplaces are rapidly developing by development of information technology in the world. An electronic marketplace is a virtual place where suppliers and customers can meet each other and communicated for good and service sale. Emergence of these types of markets owes to information technology development. IT reduces temporal and local limitations considerably.

Difference between electronic marketplace and electronic procurement or electronic commerce is that there is only one buyer in electronic procurement or electronic commerce, while there are several buyers in electronic marketplaces and suppliers can utilize this advantage optimally. Electronic marketplaces may have following features:
- Suppliers and buyers union
15. Electronic Procurement

Electronic procurement mechanizes supply and purchase activity in the organizations using the internet technology. Considering most organizations seek for reducing their management and administrative costs and they are eager to manage their cash flow more optimally, electronic procurement systems are introduced as an efficient and effective tool to this end. Electronic procurement systems are often based on web, they are controlled and directed through internet and they are totally automatic. These systems integrate good and service supply flow between supplier and buyer. Providing useful and timely information for increasing purchase decision effectiveness is the other advantage of these systems (Ministry of Communications and Information Technology, 2002) (Lars Bisgaard, 2002).

16. Advantages of Electronic Procurement Systems

Implementation of electric procurement system can bring about reduction in direct and indirect costs, increase purchase efficiency, decrease total production cost, and improve purchase control. Some of the main advantages of electronic procurement include as follows (Ghaffari Touran, 2008 c):
A. Suppliers management improvement
B. Reducing costs and saving in procurement process
C. Improvement of documentation
D. Increased speed

Most purchase activities are repetitive and routine. The time spent on activities is reduced and purchase efficiency is improved by automating procurement system.

17. Necessity for Electronic Procurement Use

Increased competition in the business directed companies to acquisition and promotion of competitive advantage. Four main areas where purchase can play basic role include (Ghaffari Touran, 2008 c):
A. Compressing and integrating supply chain
Purchase activity in supply chain is related to other activities. The main key to survival and development is integration and coordination of the members. E-procurement systems can be used as important tool for integrating the supply chain.
B. Pressure to reduce costs
With the development of internet shopping activities, this sector is introduced as one of the vulnerable areas to reduce costs in organizations.
C. Need for efficient operations
Companies that develop products quickly and produce faster will receive a greater share of the market. In all parts of the supply chain there is a need to increase efficiency and the purchase is no exception.

18. Electronic Procurement System in People Soft Company

People Soft Co. which is one of greatest software companies in the world acts in integrated solutions. Enterprise Resource Planning (ERP) and Supply Chain Management (SCM) systems are main products of this company. Exceptional fame of this company is due to production and supporting customer relationship management systems. This system has helped many companies in facilitating purchase and procurement process and acquiring competitive advantage by development of supplier relationships. The companies which have used this system obtained advantages on the following areas (Niof, 2001):
- Reduced overall cost by capital control and procurement cost management
- Improved relationships of suppliers with reducing returns and customer support costs
Empowering employees to make fast, better and more efficient decisions and freeing up time to focus on more important tasks with more value added. Major features of this system are (Niof, 2001):

A. Controlling investments through:
- Development of procurement development and integration of it in the entire organization
- Automation and controlling procurement process inside and outside the organization
- Developing customer relationships
- Reduction of process and material costs
- Effective evaluation and tracking performance of suppliers
- Instant access to inventory information
- Reducing the level of inventory

B. Implementation considering organization characteristics
Concentrated or non-concentrated purchase types or combined types of purchase may be used in different organizations. Considering concentration level can be customized in the purchase.

C. Capability of complex workflow support
Workflow can be designed and implemented using this software. Various control and verification points can be defined within the process. Purchase orders can be reviewed and controlled and verified status of bids.

D. Universal Procurement System
Electronic procurement system can support procurement activities at world class. Supporting various currencies and over 12 languages are unique features of this system. This system is able to support various tax methods in tax and custom systems.

E. Integration in the entire organization
With implementation of electronic procurement system in People Soft Company it is possible to integrate this system in other practical systems such as human resource, project management, financial and accounting management and inventory management at organizational level.

F. Budget Management
People Soft Company’s electronic procurement system provides capability of budget review and management for the users.

G. Supplier Management
Electronic procurement system supports a wide range of technologies from fax, electronic data interchange, XML-based systems and suppliers from each system can communicate with People Soft Company’s electronic procurement system. Capability of management and communicating with several suppliers and recording and registering their information are features of this system.

H. Comprehensive Order Process
Users at every organization with any level of education and knowledge can use electronic procurement system and order their needed requirements. Using simple order forms, customization of order requests for each user, processing purchase order information and, providing one or more unit order, and establishing formats for ordering common items are features of this system.

I. Procurement Card Support
Purchasing cards can be used for purchases which have low financial value. Electronic procurement system in People Soft Co. allows performing common purchases without administrative procedures and bureaucracies with supporting procurement cards.

19. Standard Procurement System (SPS)

Standard procurement system (SPS) is an automatic and totally integrated information and operational system which standardizes procurement processes and information in U.S. Department of Defense, and facilitates use of identical procedures in contracts of Department of Defense. This system was developed for review plan and integrates common procurement processes in U.S. Department of Defense with novel changes and top business experiences.

Standard procurement system (SPS) covers all procurement processes from declaring need until the end of contract. Basic software for utilization of this developed system is Procurement Desktop Defense (PD2). Some of processes which are mechanized by this system include (Ghaffari Touran, 2008 c):
- Collecting the requirements
- Identifying and determining the appropriate method for acquisition, system, goods and services, and selection of supply source
- Declaring, amending or terminating the contracts
- Inspection and acceptance of systems, goods and services
- Liquidity and financial holdings management
- Setting financial limits and regulations
- Evaluating, approving, tracking and following up the payments
- Evaluating performance of contractors
- Maintenance of records of contract

Information and operational relationship is established in the system and other common systems with development of new standard procurement system. However, this system will gradually replace new systems. Capability of communication with other systems of U.S. Department of Defense such as financial, accounting and material management systems is considered in this system. Standard procurement system Interface (SPSI) allows transferring data between standard procurement system and other systems. Some capabilities of standard procurement system include (Ghaffari Touran, 2008 c):
- Possibility of electronic data interchange
- Search and retrieval of data
- Supporting electronic signature
- Sub-contractor performance evaluation
- Management of local and operation data
- Management of shared and organizational data
- Maintenance of operating records
- General analysis and assessments
- Procurement program management
- Archive and retaining records of contracts
- On-line Help System
- Online IFB, RFP and RFU development

Standard procurement system processes are mechanized in the form of three models: determining requirements, contract, and after contract.

20. Total Asset Visibility System

One of the great changes in information technology is automatic identification and tracking of the organization’s goods and equipment with combination of wireless computer communication, which enables the organization to track moving equipment such as trucks, ships, etc. and be aware of their location and position, and if it is decided to change their path, it is done immediately with sending message (Ghaffari Touran, 2007 b).

Total Asset Visibility is a system which provides accurate and timely information regarding location, movement, situation and identification of units, personnel, equipment and suppliers to the users at any operational level. In fact, this system provides information related to assets in logistic process for managers so that they can respond orders and needs of users using this information and reduces uncertainty in administrative logistic decisions.

21. Joint Total Asset Visibility (JTAV) System

Joint Total Asset Visibility (JTAV) system is assets and capital information management system of Department of Defense (DOD). The aim of designing this system is access to information of joint military operations in peace and war. With access to information of this system, all army levels in US Department of Defense will be aware of defense capability and military power of armed forces. In addition to information of assets and equipment, information of inventories and human resources is also kept. This system provides accurate information on the situation, location and movement of assets, equipment, material and armed forces (Ghaffari Touran, 2007 b).

22. Advantages of Total Asset Visibility System
It is clear that application of Total Asset Visibility System as well as automatic identification technologies in logistics will bring many advantages, some of which include (Ghaffari Touran, 2007 b):
- Access to accurate, timely, safe information on the location, movement and status of assets and also identifying units, personnel, equipment and logistical resources
- Improving logistic performance
- Accelerating the readiness in logistics operations
- Comprehensive and integrated management of assets
- Preventing from excessive work in property and equipment requested by the forces
- Avoiding additional transportation
- Speed in managing and controlling inventory items and equipment
- Reducing costs and inventory, improving productivity and maintaining auditing the assets of the organization
- Providing accurate information about the needs, deficiencies, and costs of assets
- Providing accurate information inventory stored in circulation and used inventory
- Increasing effectiveness and efficiency of different logistic operations, such as warehousing, transportation and inventory management

23. Electronic Multi-Faceted and Multidisciplinary Bilateral Negotiations between Buyer and Seller Agents

Electronic negotiation is a process in which two or more agents reach to certain decision. A protocol for communication, model suggestion, proposal change, scoring and final decision making should be designed for negotiation of the agents so that maximum profit is brought for the independent agent (Poursardar and Nematbakhsh, 2003). That is, various factors should be considered including implicit and explicit attitudes of the rival parties, the current market situation, the objectives of the parties, the remaining time to continue negotiation and other parameters that can influence negotiation (Dajoun and Katia, 2001). The agents should follow some rules to interact with each other and these rules represent the way of communication between agents. In a negotiation, protocol is the negotiation which states the way of agent interaction (Poursardar and Nematbakhsh, 2003). Proposal exchange causes communication between agents, so that new proposal is raised by receiving a proposal. This process continues until agreement or disagreement between parties is reached. Figure 2.3 shows negotiation protocol.

The agent which starts negotiation (Agent A) creates the first proposal and sends it to the respective agent (Agent B). due to considering multifaceted negotiation, the proposal which is sent is not just about one aspect of the negotiated good, rather it covers several aspects. Agent B receives the proposal and evaluates it and creates a mutual proposal if it is not optimal. Then, he sends it to Agent A. evaluation and creating mutual proposals is repeated several times between agents (dotted marks in Fig 2.3) so that the agents accept the proposals or the negotiation time is ended and negotiation is terminated.

The purpose of this method is automating negotiation by designing software agents which allow reaching acceptable cases for negotiation parties in transactions.
Advantages

Slow trend of human negotiations is today one of the weaknesses for these negotiations and outcomes of which are not optimal often due to cultural issues, personality of parties and etc. these problems can be avoided using software agents and it can be provided automatically. Reduced negotiation time, possibility for participation of negotiator in several negotiations simultaneously and reduced transactional costs are advantages of electronic negotiations (Poursardar and Nematbakhsh, 2003).

Software agents are able to capsulate information, they can interact with their environment anonymously, and thus they can participate in a negotiation independently and fulfill tasks desired by the negotiation.

Conclusion

Information technology has provided such a ground in which suppliers and buyers can communicate with each other free from temporal and local concerns and limitations, and perform transactions and interactions at any point of the world in the lowest time and cost. Using IT capabilities in logistic systems it is possible to observe considerable improvements in purchase process. One of the main features of logistic systems is their geographical dispersion. To overcome this problem, IT provides effective solutions.

Preliminary feasibility studies concerning development of requirements and infrastructures, formulating policies and strategies of IT and developing comprehensive program are necessary to have more effective IT use in logistic system.
In the current work it was attempted to introduce the main novel approaches in purchase systems. Following cases can be used in the organization to implement mentioned approaches:
1. Supply chain management
2. Reduction of cycle times
3. Visual communication with suppliers
4. Integration with organizational strategy
5. Delegation of procurement process
6. Ambiguous boundaries between functions and even eliminating these boundaries
7. Using attractive systems in production
8. Reducing the number of third and fourth level supplies
9. Making network for suppliers
10. Simultaneous contract with two suppliers for design and construction
11. Information highroad or internet
12. Smart computer agents
13. Expert systems, artificial intelligence

26. Recommendations for Implementing Approaches

- Estimating needs and facilities needed by the organizations to apply novel approaches in purchase systems
- Identifying opportunities and threats for Iranian organizations in case Iran joins the World Trade Organization
- Conditions and requirements necessary for Iran to join the World Trade Organization
- The way of implementation and globalization of the organizations
- Problems of sanctions and ways to combat them
- Tariff and non-tariff barriers and ways to combat them

References