Sudan University of Science and Technology

College of Engineering

School of Mechanical Engineering

Department of Production

Development Supply Chain of Information System

تطوير نظام معلوماتي لسلسلة الإمدادات بإستخدام برنامج محوسب

A project Submitted in Partial Fulfillment for the Requirement of the Degree of B.SC (HONOR) In Mechanical Engineering

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الآيـــــة

قَالَ تَعَالَىٰ:

بسم الله الرحمن الرحيم

﴿ لَا يُكَلِّفُ ٱللَّهُ نَفْسًا إِلَّا وُسْعَهَاۚ لَهَا مَا كَسَبَتْ وَعَلَيْهَا مَا ٱكْتَسَبَتْۗ رَبَّنَا لَا تُؤَاخِذْنَآ إِن نَّسِينَآ أَوْ أَخْطَأْنَاۚ رَبَّنَا وَلَا تَحْمِلْ عَلَيْنَآ إِصْرًا كَمَا حَمَلْتَهُۥ عَلَى ٱلَّذِينَ مِن قَبْلِنَاۚ رَبَّنَا وَلَا تُحَمِّلْنَا مَا لَا طَاقَةَ لَنَا بِهِۦۖ وَٱعْفُ عَنَّا وَٱغْفِرْ لَنَا وَٱرْحَمْنَآۚ أَنتَ مَوْلَىٰنَا فَٱنصُرْنَا عَلَى ٱلْقَوْمِ ٱلْكَٰفِرِينَ ﴿٢٨٦﴾ ﴾

صدق الله العظيم

سورة البقرة الآيه ٢٨٦

DEDICATION

TO OUR PARENTS AND FAMILY

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ABSTRACT

There is a lack of information sharing within companies nowadays, which results in inefficiency of coordinating actions within the units in the company or organization, The purpose of this project is to build prototype system called MMA system by using C# and Microsoft visual studio program, The result of this project is supply chain integration. Evince the influence of supply chain integration on information sharing and Supply chain performance. Furthermore, improved supply chain supply chain coordination, reduced supply chain costs and the time.

المستخلص

هناك تأخر في تبادل المعلومات داخل الشركات المختلفة مما يؤدي الي ضعف في كفاءة تنسيق الأعمال داخل الاقسام أو الإدارات في الشركة ، إن الغرض من هذا المشروع هو بناء نموذج محوسب بأستخدام لغة **(C – sharp)** وبرنامج **(VISUAL STUDIO)**، ونتائج هذا المشروع هي المساعدة في رفع كفاءة سلسلة الإمدادت عن طريق برنامج حاسوب يقوم بالتنسيق الكامل لأقسام سلسلة الإمدادت وتوفير المعلومات بسلاسة ودقة وسرعة عالية ويساعد في خفض التكلفة وتقليل الجهد والزمن.

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CHAPTER ONE

INTRODUCTION

1.1 INTRODUCTION

The Supply chain is connected chain of all of the business entities, both internal and external to the company, that perform or support the logistics function.

Supply Chain Management is system that coordinates and integrates all of the activities performed by supply chain members into a seamless process, from the source to the point of consumption, resulting in enhanced customer and economic value.

Supply Chain Information The development of supply chain information systems has been rapid and is constantly changing. They range from legacy systems developed over long periods of time without system integration, through to enterprise-wide resource planning (ERP) systems specifically designed for the integration of information throughout an enterprise and/or extended to include other supply chain members.

1.2 History of Supply Chain Management

The essential elements of the modern purchasing functions of the supply chain developed in the period from 1900 to 1939 were applied in World War I to purchase of war materials, with a particular focus on procuring raw materials.

During World War II (1939-45), the corporate significance of purchasing inputs was increasingly recognized, and courses in business logistics were

offered in various US universities, but the post-war phase was quieter as the number of market-driven firms increased in the USA.

Interest in materials management grew around 1960s to 1970s and the focus was more on solving the problems from a total system viewpoint for an organization rather than the individual function.

By the end of 1970s and the beginning of 1980s, the world business situation changed drastically and was influenced by globalization, automation, technological change, increased inflation, international competition and strategic alliances. These changes affected the SCM and gave birth to an integrated approach to SCM, where the demand and requirements of the customers and role of suppliers were accorded increased importance. In recent years, purchasing and materials management have been considered vital in adding value to the Overall

Organization and increasing its profitability and in meeting the challenge of worldwide competition, rapidly changing technology and customer expectations These changes have increased the profile of SCM in the success of an organization by emphasizing the fact that supply managers are active participants in the organization's strategic planning process.

1.3 Problem Statement

Delay and sophisticated procedure in supply chain and lack of information sharing within companies, which results in inefficiency of coordinating actions within the units in the company.

1.4 Project Aims and Objectives

The aim of this project is to develop supply chain system using a computer program. The specific objectives are summarized in:

1. To get rid of lack of information in supply chain procedures.
2. To decrease time and effort.

1.5 Project Significant

Appropriate decisions affecting supply chain performance and corrective measures to optimize the flow of procedure throughout the supply chain can be made, Manage and a chive the document, running operations can be tracking.

1.6 Project Scope

Create and develop prototype for computerize system to manage supply chain and initiate activities forms for National Upstream Solution CO.LTD (NUS Company).

CHAPTER TWO

LITERATURE REVIEW

2.1 Purchasing

2.1.1 Definition of Purchasing Management:

Strategic purchasing is the process of planning, implementing, evaluating, and controlling strategic and operating purchasing decisions for directing all activities of the purchasing function toward opportunities consistent with the firm's capabilities to achieve its long-term goals.

2.1.2 The impact of Purchasing Management:

A large study based on 175 company surveys with a respond rate of 22% performed by Carr and Pearson (2009) shows that the factors strategic purchasing and Purchasing Management have a positive impact on the firm's financial performance in both small and large firms. Carr and Pearson (2009) also write that Purchasing Management and supplier involvement does affect the success of a new product introduction.

2.1.3 The increase in supplier importance is a result of at least five factors that affect most industries:

1. The need to control unit costs.
2. The need to reduce the total cost of acquisition.
3. The increasing influence that suppliers have on the purchaser's ability to respond to end customers, particularly as it affects time-related requirements.
4. An increased reliance on fewer suppliers.
5. A willingness of purchasers to rely on suppliers to design and build entire subassemblies and subsystems.

2.2 Contract Management

the process that ensures both parties to a contract fully meet their respective obligations as efficiently and effectively as possible, in order to deliver the best value to the agency and WA Government; in its simplest form, checking that what you received is what you ordered at the quoted price; and about relationship management.

2.2.1 We need to manage contracts:

To achieve the agency's business outcomes and deliver savings/ efficiencies as part of the agency's ongoing risk management because it is good practice to meet various governance, legislative and audit compliance requirements,

For example:

- State Supply Commission Act.
- Financial Management Act and Treasurer's Instructions.
- State Records Act and Freedom of Information Act.
- Office of the Auditor General.

2.2.2 When is contract management important?

Contract management is an integral part of the whole procurement cycle and should play a key role during:

- The contract planning/development.
- The contract award.
- The contract management phase.
- Contract review/planning.

2.2.3 The benefits of contract management are:

- More favorable outcomes.
- Improved quality of services.
- Decreased risk.
- Early identification of issues.
- Clarity around roles and responsibilities.
- Collaborative approach to solve problems and seek efficiencies.
- Good relationships with open lines of communication.

2.2.4 The risks of not doing contract management are:

Failure to fulfil contractual requirements

- Unauthorized changes to contracts
- Unethical or fraudulent behavior
- Conflicts of interest or lack of confidentiality
- Limited recordkeeping of contractors performance
- Non-compliance with legislative requirements
- Not achieving value for money outcomes.

2.2.5 The role of a contract manager

A contract manager should ensure that they:

- Manage relationships with stakeholders;
- Understand the overall scope and nature of the contract, its primary objectives, and the risks involved.
- Monitor, manage, document and communicate contract requirements to maintain continuity of supply, ensure compliance with specified customer expectations, contract deliverables and budget.

- Are proactive, act with due care and diligence and observe all financial and legal requirements during the course of the contract.
- Manage any disputes or issues to avoid them escalating .

2.3 Logistics

the process of strategically managing the efficient flow and storage of raw materials, in-process inventory, and finished goods from point of origin to point of consumption.

2.3.1 Logistical Components of the Supply Chain contains:

1. Sourcing & Procurement.
2. Production Scheduling.
3. Order Processing.
4. Inventory Control.
5. Warehouse & Materials Handling.
6. Transportation.

2.3.2 Outsourcing of logistics functions and outsourcing Benefits:

- Reduce inventories.
- Locate stock at fewer plants and distribution centers.
- Provide same or better levels of service.

2.3.3 Operational responsibilities of logistics

2.3.3.1 Logistics stages

Logistics in most organizations generally involves three stages.

Stage 1: inbound logistics the first stage involves the transportation of goods from suppliers to the purchasing organization's operation or warehouse. In logistics operations particularly those involving international shipments it is

essential that all the organizations involved know precisely the point when and where they must assume responsibility in terms of costs and risks for the products being shipped. This will govern the rights and responsibilities for access, handling, security, insurance and use of the goods.

Stage 2: internal distribution (also materials management) The second stage in the logistics process involves the movements of materials and components within a firm, including the breaking down of bulk loads into composite smaller shipments for onward distribution to stores, production lines or retail outlets.

When handling incoming supplies, it is important to remember that not all goods being supplied will be owned or purchased by the organization. Some may be supplied under sample, license, consignment, lease or rental agreements. All products should be handled with the care and attention they deserve, but products not owned by the organization should be segregated in the warehouse for ease of identification and may require additional status reporting. The organization may also incur considerable penalties if these products are damaged or delayed.

Stage 3: outbound logistics this relates to the flow of distribution and the transportation from the organization to a subsequent customer, either another stage in the production process, a retailer, or some other supply chain member.

Companies generally seek to integrate their approach to logistics by linking these operational stages to ensure that together they serve to achieve the organization's corporate objectives as effectively as possible. At the level of the supply chain, member enterprises must also closely link up their logistics processes if the overall strategy of the supply chain is to be attained.

2.3.3.2 Main day-to-day responsibilities

The following list indicates the scope of the logistics manager's involvement in an organization's day-to-day business activities.

Managing the interfaces relating to delivery of goods between suppliers, transport operators and the company's users or customers, scheduling and organizing the supply of inputs to manufacturing operations and determining the most economic load sizes, organizing picking and packing according to requirements and supply schedules, ensuring the preparation, labelling, cleaning, sorting and arranging of goods according to purchase specifications, managing transport in compliance with requirements and regulations, tracking in-transit products, analyzing performance and recording of deliveries, organizing the handling and inspecting of goods at the points of loading, unloading, delivery and unpacking, administering the delivery documentation to comply with credit and contract terms, liaising with shipping agents and port and customs authorities to ensure completeness of the documentation and timeliness of deliveries.

Organizing customs clearance where applicable depending on the contract terms, ensuring compliance throughout the logistics process with product handling and safety requirements, organizing "back-loads". the use of vehicles otherwise returning empty wherever possible to maximize transport efficiency, packing , transporting and controlling products that may have to be returned to suppliers (reverse logistics) or sent for re-cycling.

2.3.3.4 Balancing logistics costs & risks

One of the main tasks of a logistics manager is the continuous balancing of the costs and risks related to the holding of inventory against the costs of transport and ordering.

This responsibility goes hand-in-hand with many other functions relating to managing the international and national movements of goods for a company.

2.3.3.4.1 The cost of logistics

In the past, one reason that an integrated approach to logistics and distribution management has proved difficult was the lack of accurate cost information. Conventional accounting systems did not allow the detailed analysis necessary to identify true costs of serving customers with particular products and transportation. Without the ability to analyze aggregated cost data, it was difficult to identify opportunities for greater cost-efficiency within an existing logistics system.

Transportation, insurance, customs, handling, storage, packaging and distribution costs make up a significant proportion of the total product cost. Together with labor and materials costs, logistics is usually the third largest contributor to the total delivered cost of an item.

For example, in a typical manufacturing business, logistics often accounts for about 20% and can rise to 30% of the total purchase cost of an item.

The efficiency of logistics operations has both a direct and an indirect effect on the total product unit cost and on an organization's operating profit. Some logistics costs may be obvious and include the cost of transportation, insurance, inspection, handling and shipping agents' fees. Other costs are less evident, and are therefore often neglected. For instance, whenever a product rests immobile in storage, the organization's cash-flow cycle is lengthened without any recoverable value being added to the product.

Money or capital tied-up in idle stock cannot be used for other purposes. The cost of this capital is the value of the stock held (unit purchase price +

apportioned logistics costs to the storage stage + the costs of deterioration and write-offs) multiplied by the percentage interest rate that the organization pays on short-term loans for working capital.

Components of total product cost is:

Total unit cost = Unit purchase price + Logistics costs (transportation, storage and handling) + Cost of managing risk (e.g. insurance) + Transaction costs (e.g. exchange rate loss) + Deterioration and write-offs + Cost of capital (% interest x value and other credit management costs) from supply invoice payment until sales cash receipt

There are also opportunity costs to be added to the above, the results of business profit lost and customer dissatisfaction because the product is immobilized rather than being used or sold opportunely.

Shortening transportation and storage times and optimizing load sizes increases the profitability of an organization through lower capital costs, faster cash flow, less damage and obsolescence, reduced warehouse space requirements and lower handling costs. These issues will be examined and discussed in the following Units of this Module.

2.3.4 Strategic responsibilities of logistics

In addition to their operational responsibilities, logistics managers have an important role to play in business planning and business strategy. Logistics performance, advice on technical matters and realistic capability and process evaluations are particularly important in the following situations:

in mergers, acquisitions and divestments at all stages from initial feasibility studies through planning and negotiation to the eventual joining together or splitting off of two or more operations logistics managers can advise on reducing the complexity and risk of merged, acquired or divested logistics activities, in the consolidation or separation of divisions within the same

company or group of companies the logistics function understands the outcomes for logistics costs on centralizing or decentralizing logistics activities, in new product launches logistics advice should be sought on the process of new product development, especially during the setting of specifications, choice of distribution channels and plans for product promotion as well as during the choice of suppliers and supply modes, when planning extension into new market segments, retail operations and geographical areas, and for sourcing supplies from new markets managers in the logistics function can provide the information needed on relative costs of expanding into new markets or developing new supply bases, in the choice of location for new manufacturing plants and warehouses logistics practitioners can provide data on the transportation and storage benefits of new locations, in the negotiation of service level agreements (SLAs) with customers an understanding of logistics costs and performance requirements is essential, in cases of fluctuating fuel and other resource costs and during times of high inflation and civil unrest the logistics manager can use analysis skills to understand the impact of unexpected environmental changes, when considering the implementation of Internet based activities requiring rapid response times in the inbound and outbound movement of goods logistics provides the foundation for rapid response and can provide the expertise in rapid response systems and in promoting logistics as a core competence of the company aimed at enhancing its competitive position.

As illustrated above, logistics should be considered at all stages and levels of the process of developing corporate plans and strategies.

2.4 Advanced computer technology

- Automatic identification systems.
- Communications technology.
- Supply chain software systems.

2.5 Inventory

Is a stock of goods or other items owned by a firm and held for sale or for processing before being sold, as part of a firm's ordinary operations.

2.5.1 Inventory Management

Inventory management is simply the way that the accumulation of these materials is optimized so that the business can satisfy its customers' demands for the delivery of a required quantity and quality of products, at the right time and at the minimum cost to the business. It includes: analyzing the build-up and evaluating the need for keeping inventory in the supply chain, forecasting demand for materials and components, and the development of inventory monitoring, supply planning and control mechanisms. Along with the management of internal logistics, it also deals with physical inventory handling locations and facilities.

2.5.2 Why Inventory Management is Important

Efficient inventory management is important to an organization mainly because of the position of inventory in the working capital cycle (or order-to-cash received cycle).

2.5.3 Within the supply chain there are three common stages of inventory:

1. Raw-material inventory – inventory that is stored before it is used in the production process.

2. Work-in-progress inventory – partially finished inventory that is within the production process.
3. Finished product inventory – inventory of product ready to be sold.

In the past, organizations employed manual or visual techniques of order replenishment, also known as reorder point (ROP) replenishment techniques. Certain variables were also then brought into consideration, including set-up, holding and carrying costs in addition to lot size quantities that serve as a basis for statistical reorder point techniques.

With the introduction of computer systems, the calculation of quantity and timing of inventory has become relatively easy and accurate. The result of this has been a dramatic decrease in the level of inventory held by companies and within the supply chain as a whole.

2.5.4 Operational responsibilities of logistics

There are several types of inventory, reflecting the reasons why inventory is held.

1. Normal inventory

This is inventory required to support the normal replenishment process under conditions of certainty. If demand and lead times are consistent, normal inventory is what the organization needs to meet customer demand at a given point in time.

This inventory should generally be as close to zero as possible. However, this may not happen due to transportation, production or distribution economies of scale.

A larger than needed quantity of goods may often thus be shipped, produced or distributed at a given point in time so that fixed costs are spread

over a wider range of units, thus bringing overall costs down and providing savings within other parts of the supply chain.

2. Safety inventory

Safety inventory is the inventory held in addition to normal inventory to cover for uncertainty in demand, in lead-time and in quality of supply. It literally provides a safety net for the organization, protecting it against stock-outs due to surges in demand, delayed deliveries or quality issues.

3. In-transit inventory

This is inventory en route from one location to another. This type of inventory will either belong to the shipper or to the customer depending on the terms of sale.

4. Speculative inventory

This is inventory held for reasons other than meeting current demand. For example, the company may decide to buy and stock more than it needs if it thinks that prices of a needed material will rise or if a supplier offers a lower price if a large quantity is purchased at one time.

5. Seasonal inventory

Seasonal Inventory is accumulated in advance of a significant selling season. If the majority of sales occur in relatively short periods of time, companies may stock seasonal inventory to stabilize production over a more extended period of time and maintain their labor force capacities.

6. Dead inventory

This is inventory no one wants but is held for a number of reasons. Managers may expect demand to resume in the future or it may cost more to dispose of than it does to keep. Alternatively, it may serve as a form of customer service if an important buyer has an occasional need for the item and it is kept as a goodwill gesture.

2.5.5 Factors affecting inventory policy

There are many factors that will affect the type of inventory policy a company or supply chain will choose to implement.

1. Demand

The first is the certainty or uncertainty of customer demand. If demand is relatively stable and certain within a supply chain, there is little need to hold inventory, as products can be made to order very efficiently. However, if demand is variable and uncertain, then inventory may need to be held at points in the supply chain close to the customer to ensure a supply of goods when they are demanded. Customer demand may be known in advance or it may be random, with historical data used to estimate average customer demand and variability, measured as the standard deviation.

2. Lead-times

Another factor to consider is the replenishment lead-time, i.e. how long it will take to get the product to the customer once an order has been placed. Replenishment lead times, like customer demand, are either known or uncertain. If they are known, then it is easy to calculate inventory levels and minimum inventory levels will be kept. If replenishment lead times are unknown, then inventory levels will be higher throughout the supply chain.

3. Range and variety of products

The number of items in a company's product range will also contribute to the need for inventory. If a company has a wide range of products, its inventory levels will tend to be higher than if a small range of products is produced. The variety of components used in the products that are manufactured will also have an impact on inventory levels.

Using shared components and delaying the customization of products as far as possible down the supply chain will lead to variety reduction, and thus lower levels of inventory.

4. Required service level

Furthermore, the type of product will affect inventory levels. For instance, products needed quickly and with a higher service level will require storage close to the customer; the inventory levels will be based on the acceptable service level for the customer. Customers expecting immediate product availability will turn to competitors for a substitute if these are unavailable.

It is important then to keep in mind the balance of the cost of holding inventory with the cost of not holding inventory.

2.5.6 Where to hold inventory in the supply chain

Inventory is generally held at various stages in a supply chain. For example, in the hypothetical case of a supply chain for bicycles: Stocks of finished bicycles can be held by retailers, by the wholesaler and / or by the bicycle assembler.

Stocks of bicycle components (e.g. frames, wheels, chains, lights, etc.) can be held by the assembler and / or by the component manufacturers themselves.

Stocks of materials for manufacturing these components (e.g. steel, aluminum, rubber, plastic, etc.) can be held by the component manufacturers and / or by the suppliers of these materials.

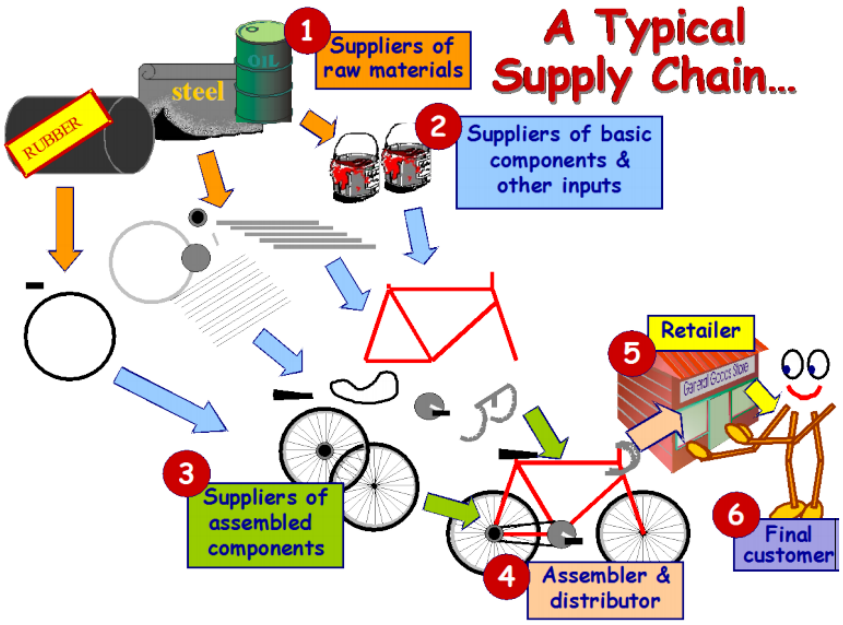

Figure 2.1: hypothetical case of a supply chain for bicycles

Inventory policies that determine how much stock is to be held at each of these locations in the supply chain should not be set in isolation by the companies involved. Ideally, these policies will be established in close consultation amongst all firms that make up the supply chain, in order to rationalize inventory levels throughout the chain based on specific marketplace requirements and priorities.

2.5.7 Inventory Management Signs of Trouble

Within the supply chain it is relatively easy to identify when inventory policy and inventory management are not working and need to be fixed.

The most obvious sign is the loss of customers due to stock-out situations, which will not be tolerated by customers for long if alternative sources are available. Customers may remain loyal at first but will sooner or later shift to suppliers who can deliver reliably.

Another symptom of a malfunctioning inventory management policy is the rising number of customer back-orders. This means that customers

have to wait increasingly for their orders to be satisfied and, as above, will not wait for long before changing to an alternative supplier.

A further sign of trouble is a growing investment in inventory despite a stable number of back-orders. Normally, if inventory is growing, backorders should be falling. If that is not happening, it likely means that the company is holding inventory of the wrong items.

Excessive peaks in inventory resulting in higher carrying costs could result from ordering goods too early, from poor demand forecasting, from unforeseen variability elsewhere in the supply chain, or from holding the wrong items. These inventory management malfunctions will also have an effect upstream and downstream in the supply chain, with deteriorating relationships amongst supply chain members. If a company cannot consistently provide the products needed, relationships with customers will suffer.

Stock-outs or back orders resulting from poor inventory management and policies causes supply chain members to cancel orders or find another supplier. Each of these signals appearing will indicate that it is time to review the inventory management within the company and throughout the supply chain to try and understand what is going wrong.

What may be needed is an overhaul of the whole inventory management system or a rethink of the role of Inventory within the supply chain. There are a number of tools to help managers with these decisions, as described below.

2.5.8 Jest In Time Inventory management (JIT)

JIT is based upon a number of principles

1. Quality

The customer is the most important member of the supply chain and must receive goods of the required quality. One of the historical roles of inventory was to protect the customer against quality issues.

Inventory would ensure a sufficient supply of products which did not have defects, allowing any defective product to be discarded and a new one taken from inventory. Within the JIT mindset, poor quality now has to be eradicated. For instance, if there is a problem on the assembly line in Toyota, the production line is stopped and questions are asked to get to the root cause of the problem. This is also called the "Five Whys", because asking "why" five times regarding a problem and the answers given to this very question allows you to get closer to the fundamental cause of the quality problem. Within this approach, the logic is that quality becomes perfect and there is no need any longer for extras in inventory to replace defective goods.

2. Applying the "pull" approach

Under JIT, production is usually not initiated until customers' orders are received. It is therefore considered to be the embodiment of the "pull" approach to supply chain management.

3. Suppliers as Partners

The JIT system relies on fewer suppliers, with relationships built on mutual dependence, trust and cooperation. Suppliers are regarded as part of the organization, with the same stringent quality aims.

They are also included in the planning process, sharing information regarding sales and production forecasts to provide a clear idea of what customers need throughout the supply chain.

4. Vendor co-location with the customer

The idea behind co-location is that transportation is regarded as waste in the system. The nearer supply chain members are to each other, the clearer the communication and the easier it is to share information. Therefore, suppliers should be located in close proximity to the customer, as distance provides opportunity for system disruption and stock-outs.

2.5.9 Advantages of JIT

The advantages of JIT are numerous. There is the obvious advantage of lower inventory costs, as the financial costs of holding inventory are reduced and less space is needed for storage. There are more inventory turns and higher quality throughout the supply chain, as quality is engineered upstream into the production process by applying the philosophy of kaizen (continuous improvement).

2.5.10 Disadvantages of JIT

Nevertheless, there are risks involved in implementing and sustaining a JIT system. Firstly, there is the risk of stock-outs as demand forecasting must be very accurate for the JIT system to work. Furthermore, there are great demands on suppliers, who may feel that the responsibility for holding inventory has been transferred to them, and if there is a geographical distance from suppliers this could lead to variability in lead times or quality. There may also be increased transportation costs due to frequent shipments of small quantities. Nevertheless, it is claimed that these risks can be controlled and any additional costs should be offset by inventory cost savings.

2.5.11 Improving Inventory Management

There are many ways to improve inventory management and inventory policy decisions.

The first way is the realization of the importance of the role and cost of inventory in the supply chain, and securing the support from top

management for dealing with inventory problems. Also, there has to be leadership when it comes to working with other supply chain member firms.

Managers with the correct relationship management skills and practices must be encouraged, so as to ensure that activities are carried out jointly to meet customer needs without relying on Excess inventory.

Improvements need to be made throughout the whole of the supply chain, as costs within one part of the supply chain will be passed onto the rest of the supply chain. Therefore, it is imperative to have leadership in the supply chain to monitor progress and to solve problems jointly when they arise.

Demand forecasting needs to be improved and variability reduced by using appropriate IT application.

Appropriate inventory management software should be used, with packages including both demand side and supply side analysis.

Finally, the use of delayed customization should be encouraged. As seen earlier, this involves customizing products after the main manufacturing process is completed, meaning that final configuration can be delayed until the distribution cycle or even after delivery (e.g. customizing an IT system at the customer's premises).

An analysis needs to be made of all inventory items using the Supply Positioning Model 9 based on the items' level of expenditure and of its supply impact / opportunity / risk (IOR). Generally, stocks of high expenditure / low IOR items should be reduced to a minimum. Stocks of low expenditure / high IOR items should ensure 100% availability. Items that are high expenditure / high IOR are particularly suited to partnership arrangements between buyers and suppliers.

Better inventory management is one operational imperative for streamlining processes, uncovering organizational problems that need

correcting, managing costs and achieving better focus throughout the supply chain.

2.6 Warehouse

Warehouses not only serve to store products. Packaging materials, pallets and boxes will also have to be stored in secure areas for their return to suppliers, later re-use or auction. Unloading, unpacking, inspection, marshalling of products into consolidated loads for outbound transport, inter-stores movements and administration also take up space. This means choosing the site layout and equipment first, and only then dealing with issues concerning the building of the structural envelope.

A warehouse manager must try to meet five main objectives maximize the servicing of orders on time and in full, Minimize the cost of warehouse operations, maximize inventory turnover (I.e. minimize the time that materials stay in the warehouse), minimize response time to demand, and errors in dispatches, Preserve the quality, value and security of the stored items.

2.7 A frame work for identification and application of IT in SCM:

In this section, a framework has been presented for identifying the implications and applications of IT in SCM. This framework is based on the review of literature on IT in SCM. Critically reviewing the literature helped to identify the major strategies, enabling technologies and critical success factors for the application of IT in SCM. This framework is based on the following the logical development of discussions on the applications of IT in SCM:

The literature available (selected) on IT in SCM has been classified based on the nature of IT and applications, major areas of decision making and

major enabling strategies and technologies with the objective of achieving the full potential of IT in developing and managing an effective supply chain.

The sub-classification of the literature is aimed to assist both the researchers and practitioners in identifying the potential areas of development and critical success factors for the successful application of IT in SCM.

Subsequently, the gap between theory and practice and major tools used for modelling and analysis of IT in supply chain environments are discussed in this section. The major issues that need to be add rested when attempting to enhance the role of IT in supply chain integration are discussed in this section along the criteria that have been used for literature classification and review that include:

A. Strategic planning for IT in SCM.
B. Virtual enterprise and SCM.
C. E-commerce and SCM.
D. Infrastructure for IT in SCM.
E. Knowledge and IT management in SCM.
F. Implementation of IT in SCM.

2.8 Strategic planning

Strategic planning of IT in SCM has the objective of making long-term decisions such as the selection and productive implementation of IT with the objective of achieving an effective and well-connected supply chain.

Considering the characteristics of SCM, long-term decisions should promote functional co-operation as well as extended enterprise integration.

IT plays a major role in both integration and creating demand/market for products /services in SCM.

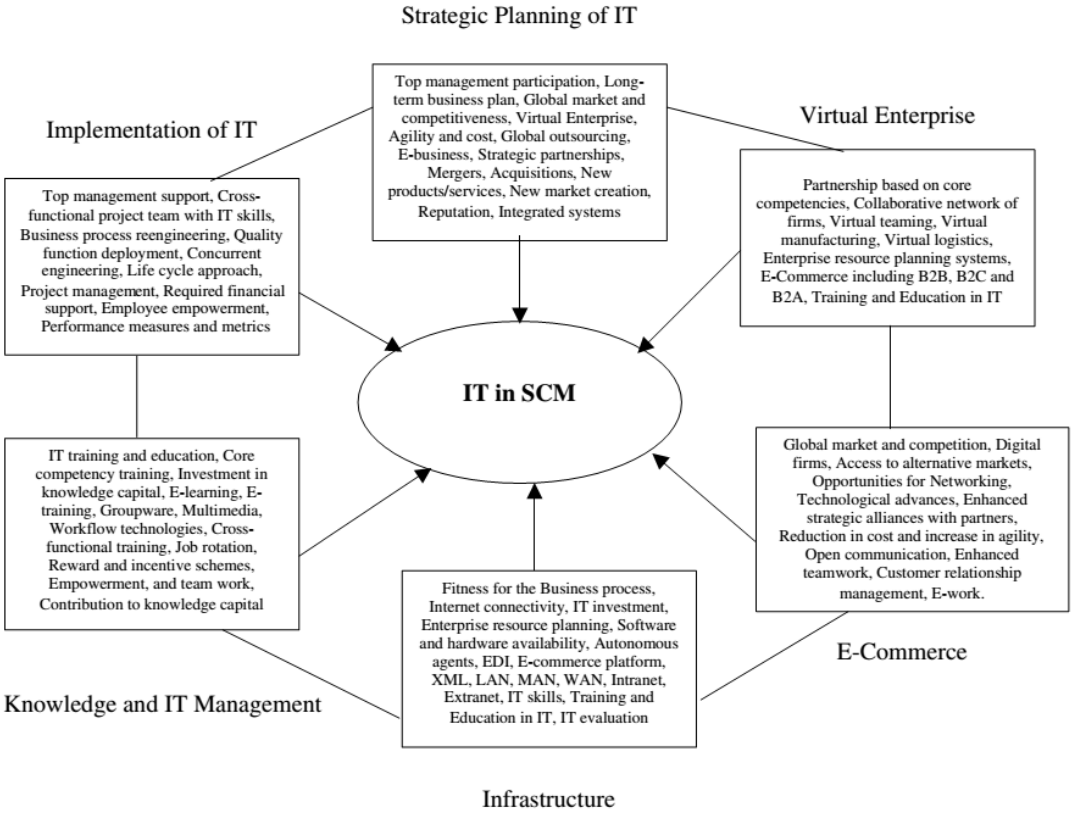

Figure2:2 a framework for the development of IT for effective SCM.

As depicted in Figure:

Top management participation is important in making strategic decisions in particular. IT investment decisions to achieve an effective SCM system. It is not just the implementation of a piece of software, but it requires some major changes in business processes and a way the company operates. This requires considerable investment in both capital and people.

Since the market has become global due to trade liberalization policies and e-commerce, it is essential a company chooses the option of global outsourcing or virtual enterprise that is based on core competencies with the objective of being agile to meet the changing market requirements. This requires strategic decisions such as merger and acquisitions with a view to reach the market as quickly as possible and that too with the right products/services.

The literature on the strategic planning of IT enabled SCM is further classified into marketing, economical, organizational and technological perspectives of IT in SCM.

2.9 The following are the examples of strategic planning for different areas of IT in SCM:

• Some companies can implement an IT system to develop an effective SCM if it has to compete in a market where the speed of de livery and quality are important.

• In order to receive financial and technical support from the government (in particular SMEs), companies implement an IT system to improve their supply chain performance.

• Companies have to compete along multiple competitive performance objectives, this requires the cost reduction as a key criterion, therefore, and they can go for, for example, an Intern et-enabled supply chain management.

• Companies have to restructure their business processes with the objective of achieving lean production by implementing an IT system to eliminate non-value adding activities by improving the communication along the value chain.

• Companies need to develop their e-commerce web site for creating a good image with their customers on technology competencies. Similar to these, there are so many strategic reasons, companies choose to go for IT –enabled SCM to summarize, the flexibility and responsiveness, globalization, new and innovative products, new markets (fleeting opportunities) and mergers and acquisitions are the major reasons for IT in SCM are the major reasons for IT in SCM.

Many companies fail to consider the long-term implication s of not investing in IT for achieving an effective supply chain. Also, assuming that the company is doing well currently and they do not need any IT means the lack of strategic thinking. May be within the next few years, the company

will lose its competitive position. Therefore, constant revision of strategies is important to take into account the changes in the market environment and technological development. This is applicable for strategic planning of IT for SCM.

Researchers should focus on developing computer aided models for analyzing the strategic implications of IT in SCM taking into account both the internal and external factors to an organization.

Since the top management does not have much time to go through a large volume of information, a system that encourages executive information perspective would be helpful. For this, fuzzy logic and object -oriented modelling can be helpful including simulation. Game theory models and simulation would be to make strategic decisions regarding the selection and implementation of IT for SCM.

Practitioner s should focus on developing a consortium and strategic alliances to develop an appropriate strategy for IT.

2.10 Virtual Enterprise and SCM

Developing a VE/VO is one of the most important strategic applications of IT in today's business environment.

VE/VO becomes an important strategy for achieving agility in supply chain. Without IT, it is difficult for a company to develop a virtual enterprise.

This type of enterprise is made up of collaborating partners who are offering different products/services based on their core competencies.

Partnership selection is based on a set of predetermined criteria taking into account the nature of business model. Some of them include their past performance along competitive.

Performance objectives, strategic objectives, infrastructure and IT systems and skills.

Virtual enterprise includes virtual reality in as many areas as possible. For example, virtual manufacturing helps to effectively manage operation s.

Computer based design enables to reduce the pro duct development cycle time.

Virtual logistics using e -commerce (web-enabled logistics information system) will contribute to the agility of an organization. Considering the importance of IT system in integrating the activities of collaborating partner s various IT systems have been implemented. Some of them include ER P systems (SAP, BAAN, People soft, JD Edwards, and or ACLE). Different e-commerce applications like B2B, business to consumers and business to administration would support the operations of virtual enterprise.

Virtual enterprise requires people trained in communicating with different languages and culture together with an understanding about the strategic objectives.

Sufficient training in information technology including JAVA, XML and web development is required for the development of a VE/VO. Suitable architecture for VE/ VO and standard s for IT system nee d to be developed for effectively developing and managing an IT-enabled supply chain. These issues offer greater challenges to practitioners to develop a framework for VE and IT system. Again, companies in a particular industry can come together to develop a joint team for this purpose. Investing in such research projects is a worthwhile effort.

Companies are unable to conceptualize the idea of virtual enterprise. M any believe this is a hypothetical system that cannot be put into practice. However, many companies have been successful with the virtual enterprise based on strategic alliances and partnership development. The main objective he re should be to convince the practitioners about the benefits of virtual enterprise. This requires education and training, perhaps researchers can contribute to this effort. Also, the concept of VE can be used and not necessarily duplicate other systems, which mean s focusing on core business

processes and attempt to outsource them using strategic alliances. Before doing this, companies have to evaluate themselves about to what extent their IT systems support the integration of partner s along the supply chain. Otherwise, one could hardly achieve the benefits of VE.

Companies need to assess their business process and IT environment and the VE, so that a suitable framework can be developed based on the overall support available from the company. Rese archers can develop conceptual frameworks to understand the role of IT and structure of VE, and hence to develop both analytical and simulation models for selecting suppliers/partners and IT based on their business strategic goals. For this, agent- based simulation modelling, multi- criteria decision making and linear programming methods could be used. Many information -sharing systems and collaborative-supported systems including collaborative team s should be employed for integration of activities in VE.

2.11 Knowledge and Information Technology Management

Knowledge and Information Technology management has become one of the strategic uses of IT in today s business environments. Many companies are considering building knowledge and Information Technology management system for organizational learning. However, in networked economy, many companies lack a suitable framework for effectively managing the knowledge and IT considering their life cycles. This requires a systemic evaluation of various knowledge and IT management strategies and techniques. There are different ways to manage the knowledge and IT.

These include strategic alignment with partnering firms, collaboration with local universities and training and education in IT. Knowledge about market and customer expectations can be acquired with web-based information systems.

This opens up the whole world of information. However, it is unlikely that companies can let their employees to spend unlimited amount of time in

searching through voluminous information. Therefore, data mining and data warehousing techniques will help to improve the speed of data processing and hence make available the right information for making timely and more accurate decisions.

Researchers are yet to come up with precise strategies and methods for managing knowledge and IT in supply chain environment.

The management of know ledge and IT requires planning, coordinating and con trolling of activities. This requires constant updating of the knowledge and IT available in an organization. No company has unlimited resources, therefore, suit able and critical areas need to be identified with the objective of optimizing the investment in knowledge and IT projects and at the same time achieving maxi mum benefits. Various decision models need to be developed for decision making in the areas of knowledge and information technology management.

Tools such as project management can be used to optimize the completion time with the limited resources available. Common industry fund needs to be established for training and education on new technologies and strategies of IT in SCM.

2.12 Gathering Supply Chain Information

The development of supply chain information systems has been rapid and is constantly changing. They range from legacy systems developed over long periods of time without system integration, through to enterprise-wide resource planning systems specifically designed for the integration of information throughout an enterprise and/or extended to include other supply chain members. The Legacy IT systems usually developed in-house prior to 1990 are systems with a specific functional focus. Legacy systems are used in order to automate many simple transactions, e.g. for logistics operations such as order entry and processing, managing inventory, warehouse operations, and simple transportation operations. They also maintain and

gather information regarding customers and products. Each activity within the organization has its own proprietary information system and there is little integration or communication between the systems.

The key characteristics of a legacy system are: firstly, their scope of information gathering is limited and usually restricted to a narrow specification; secondly, they are intended for a specific function within the organization; and finally, they are independent of any other systems and do not interact with other systems used within the organization.

Legacy systems, then, have limited use outside of their intended purpose and function. There is limited analytical capability within legacy systems as they focus on gathering data to monitor operations and are not tools for analyzing data for use in decision-making.

Their role is thus to track information and transactions rather than to understand which transactions should be occurring and why.

The advantages and disadvantages even though a legacy system is restricted to specific functions and specifications, it is still useful. Furthermore, upgrading the system is relatively cheap compared to buying a new and untested system. New systems may be costly in terms of investment, time and effort for implementation and training of staff.

In spite of this, legacy systems have several disadvantages. These include:

- They focus on only one specific function within one stage of the supply chain.
- No linkages or coordination exist within the organization or the supply chain.
- Little or no communication exists between systems within or between supply chain members.
- There is little visibility of the appropriate information to support decision-making.

- It is difficult to modify systems due to their inflexibility.

Legacy systems are typically customized over a long period of time and have "bolted-on" features that do not necessarily work well together. The systems have usually survived past their intended use through updates and add-ons to the original code.

This suggests that if the programmers who originally developed the systems leave the company, the organizational knowledge of the system and the system changes would be lost.

Furthermore, the independence of legacy systems leads to the fragmentation of information. This has consequences for the entire supply chain, as systems cannot easily communicate and standards and formats for each system are independent and unique. Information or data from one system cannot be easily transferred and compared to another system within the organization or throughout the supply chain. The costs of maintaining the systems and the costs incurred due to the inability to communicate information within the organization and across the supply chain can have a significant impact on competitiveness.

2.13 The impact of Information Technology on the development of Supply Chain Competitive Advantage

This paper explores the impact of Information Technology (IT) practices on building competitive advantage throughout the supply chain. A competitive advantage is based on capabilities that provide the necessary grounds of an organization to differentiate itself from its competitors. The majority of the relevant empirical literature identified price/cost, quality, delivery dependability, product innovation, and time to market as the most decisive sources of competitive advantage. As far as the standards in the economic environment are changing and global competition is fiercer,

organizations realize that they have to re-evaluate their enterprise business model in order to gain supply chain efficiencies.

To meet these challenges and improve their competitive advantage, companies need to both support their internal functions and exchange information with supply chain partners in an effective way. Therefore, companies must exploit IT including enterprise applications such as ERP and CRM, as well as e-procurement and e-commerce. The empirical findings from a survey of 76 manufacturing firms in Greece confirmed the crucial role of IT practices and techniques on the establishment of a sustainable competitive advantage based on Supply Chain Management.

2.14 The effects of process development and information technology on time-based supply chain performance

In recent years, in parallel with the advances in information technology and process development approaches, the importance of the supply chain as an integrated manufacturing and distribution processes which transforms raw materials into the final products and deliver them to the customers is increased. So, today, effective and efficient supply chains accepted as a key strategic factor to reach some fundamental aims of the businesses such as higher customer service, increased efficiency and developed competitiveness. Therefore, the purpose of the current study is to reveal the individual and effects of the information technology and process development activities on time-based supply chain performance which is a key strategic component of the business competitiveness. To provide a theoretical framework hypotheses and a questionnaire are developed based on the literature. To reach this purpose, furniture industrial cluster in Kayseri region is selected as research universe. Based on the data of the KAYSO, 200 questionnaires are delivered to the companies operating in the furniture industry. Analyses are made on the database which is composed 108 returned clear questionnaires.

Direct and the cumulative positive effects of the information technology and process development activities on time-based supply chain performance are evaluated.

The previously papers focus on the relationship between the organization and the customer and the advantage of the information technology for supply chain hypotheses like the CRM SYSTEM, also the ERP SYSTEM considers the best solution for the organization but the high cost for initiating and setup for the Company make it not the best solution.

The idea of MMA system is arrangement the activities inside the organization, the agility of the system provide easily use also lower cost than ERP system.

CHAPTER THREE

RESEARCH METHODOLOGY

The work on this project is divided into few tasks and this task is briefly described the in the following steps:

a. Choosing appropriate language can achieve easy and understand activities in supply chain.
b. Build the system in order to sequence of activity.
c. Gathering the data and format needed to deal and arrange the work in procedure.
d. By using NET Framework and visual studio to create data base for system.
e. Connected the sequence activity to data base.

The following figure shows the flow chart of the overall operational framework for the proposed project:

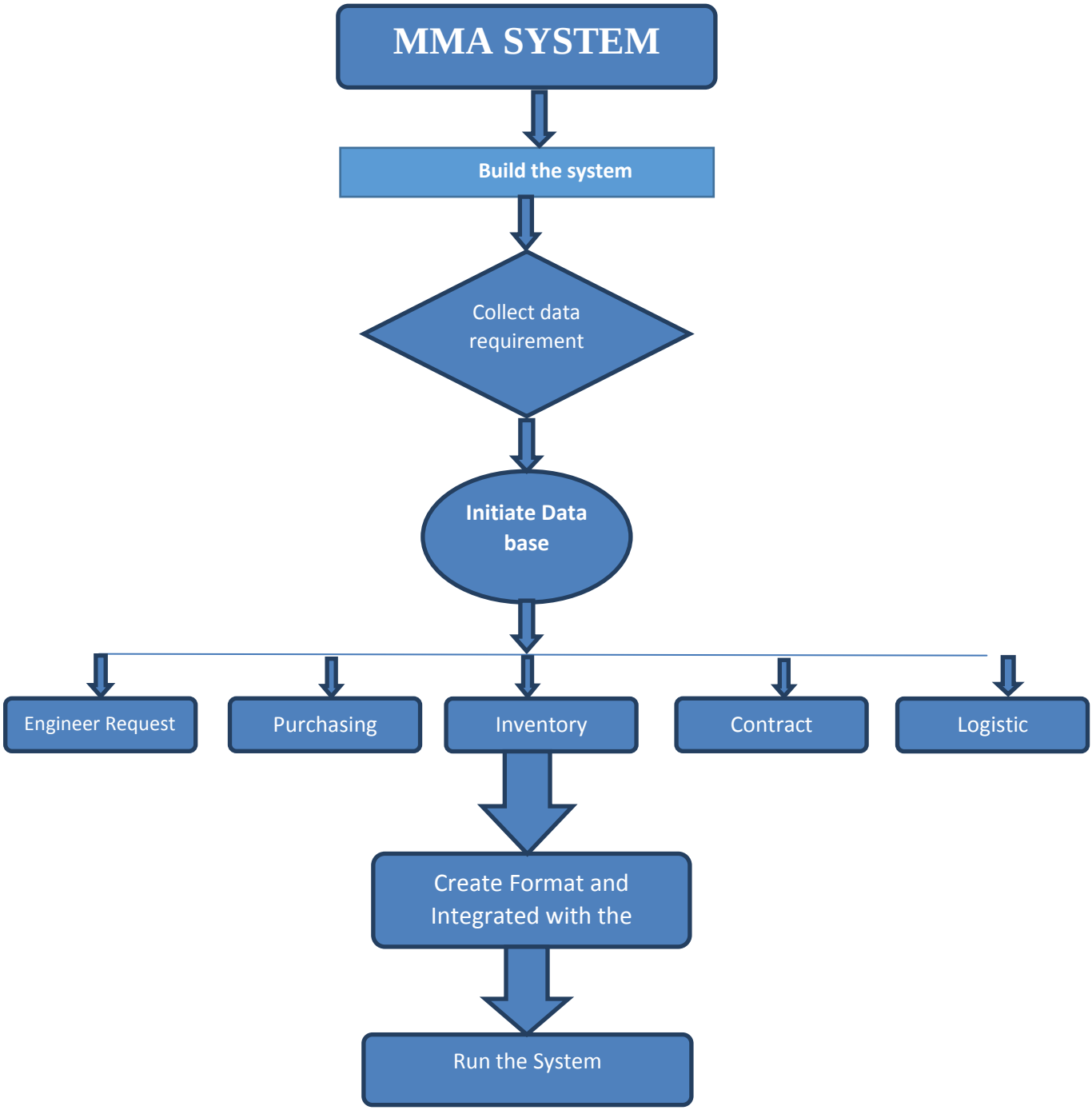

Figure 3.1: operational framework

3.1 Build the system:

By using C# is an object-oriented programming language and part of the NET family from Microsoft. C# is very similar to C++ and Java. C# is developed by Microsoft and works only on the Windows platform.

3.2 Data requirement:

In this project data assimilate all the format procedures in supply chain and Estimate data to control level of inventory.

3.3 Initiate data base:

NET Framework is a software framework that runs primarily on Microsoft Windows. It includes a large library and supports several programming languages which allow language interoperability NET library is available to all the programming languages that NET supports Programs written for the NET Framework execute in a software environment, known as the common Language Runtime (CLR), an application virtual machine that provides important services such as security, memory management, and exception handling. The class library and the CLR together constitute the NET Framework.

CHAPETER FOUR

RESULTS AND DISCUSSION

4.1 INTRODUCTION

The system activities such as Engineer Request, Purchasing, Contract, Inventory and Logistic all this activities include a formats describe the works in the phase.

4.2 THE PROCEDURES OF MMA SYSTEM

Step 1: pre material request

Step2: material request

Step3: request for quotation

Step4: technical evaluation

Step5: commercial evaluation

Step6: purchase order

Step7: shipping details

Step8: packing list

Step9: way bill

Step10: material received

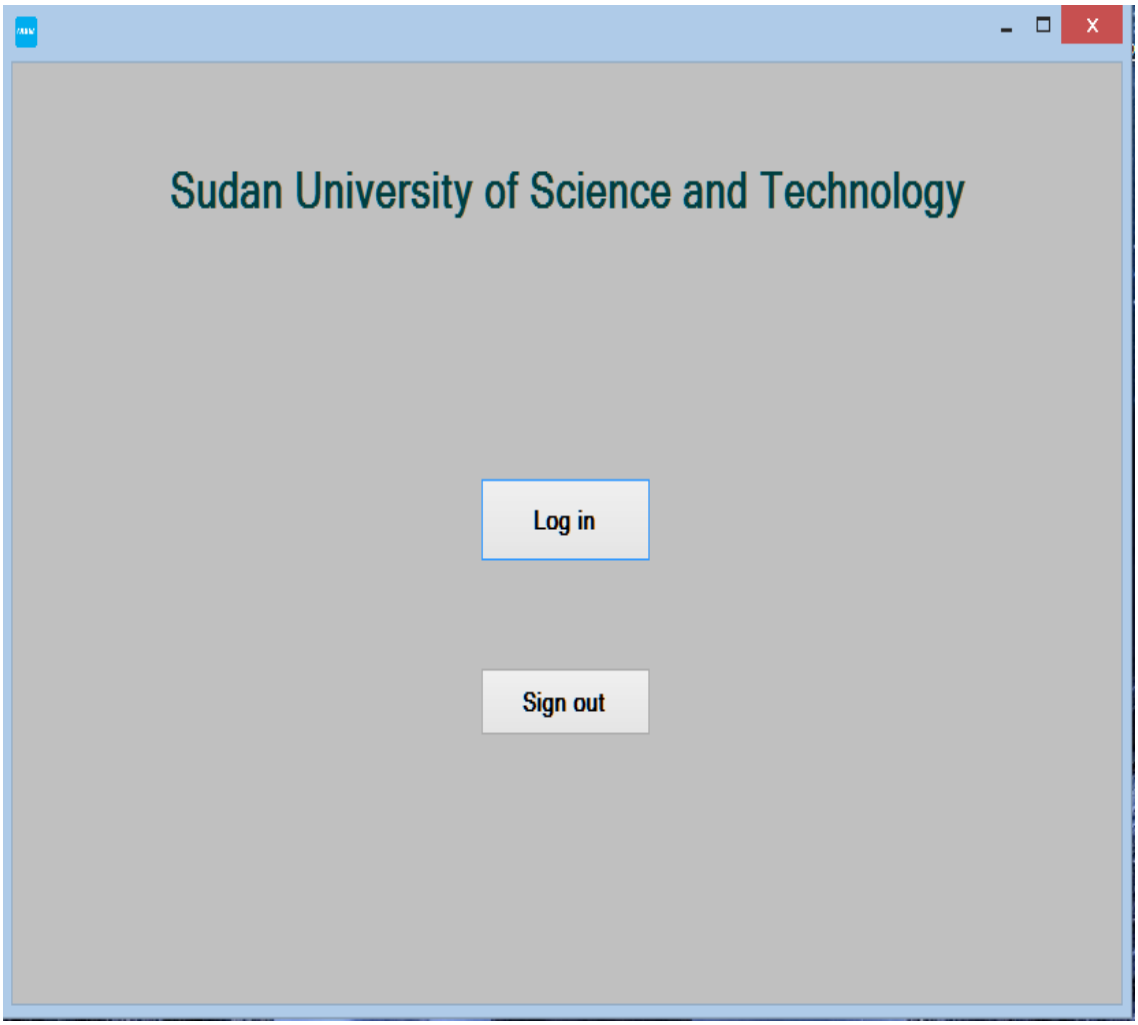

Figure 4.1: welcome screen

4.3 MMA System login

Provide for the unauthorized user to login in specific activity.

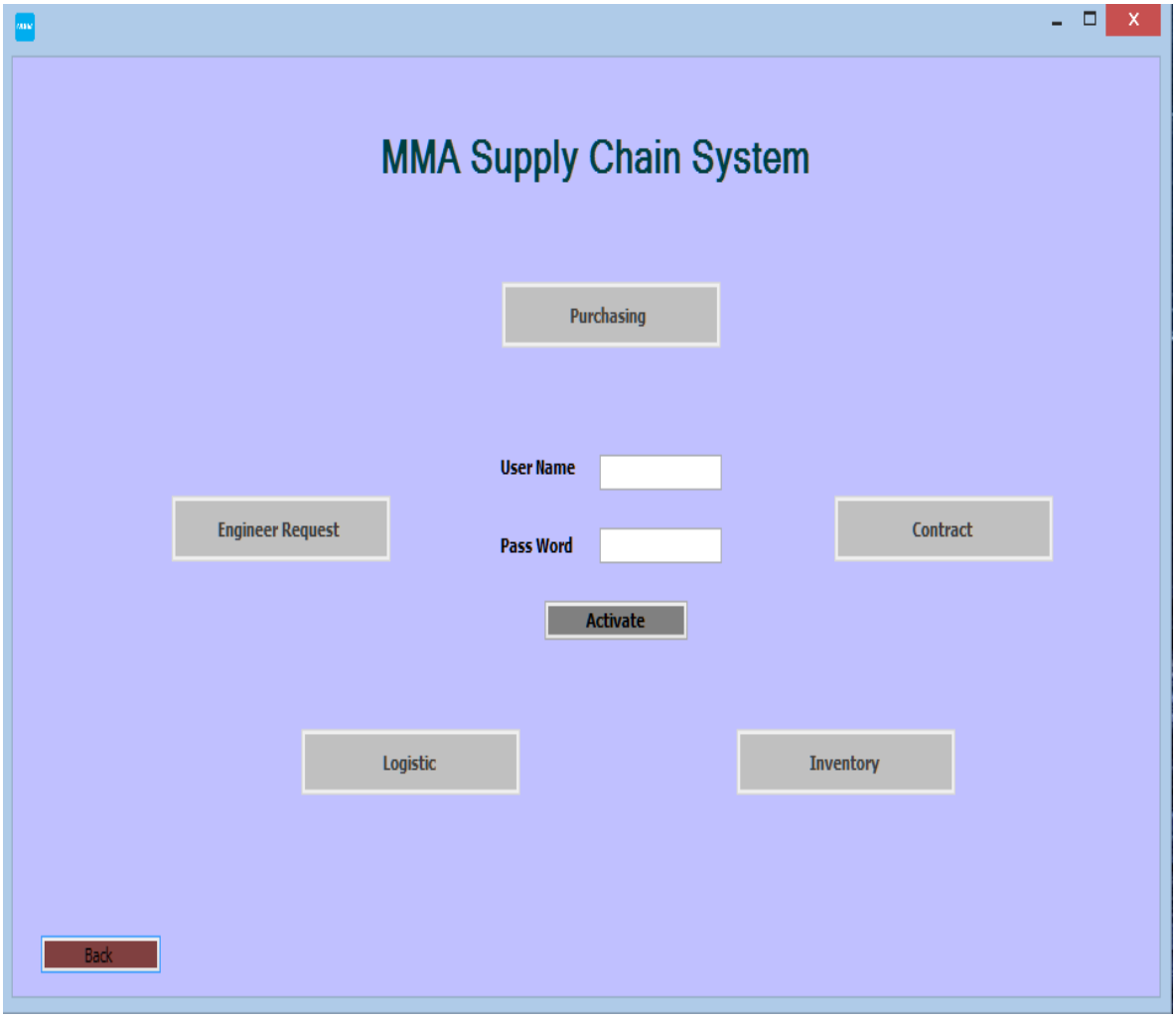

Figure 4.2: all the activities in MMA system

4.4 Engineering Request

- Pre-Material Request
- Service Request
- Material Request
- Report

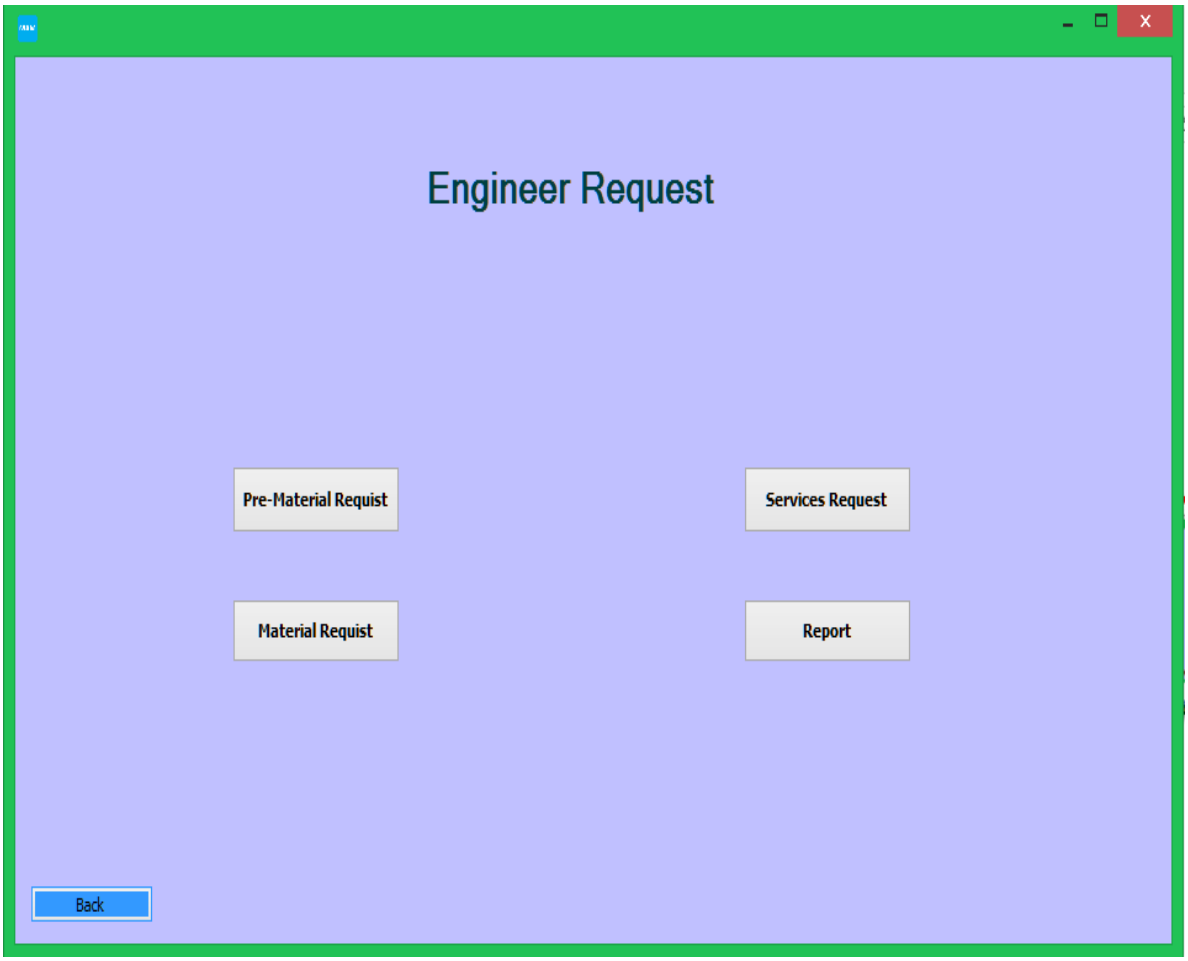

Figure 4.3: Engineering Request form

4.5 Purchasing

Divided to eight formats

4.5.1 Local Supply

- Request For Quotation (RFQ)
- Purchasing Order (PO)

Figure 4.4: Local supply at purchasing component

4.5.2 Global Supply

- Request For Quotation (RFQ)
- Purchasing Order (PO)

Figure 4.5: Global supplier at purchasing component

4.5.3 Technical Evaluation

4.5.4 Material Requisition Form (MR)

- MR
- PRE-MR

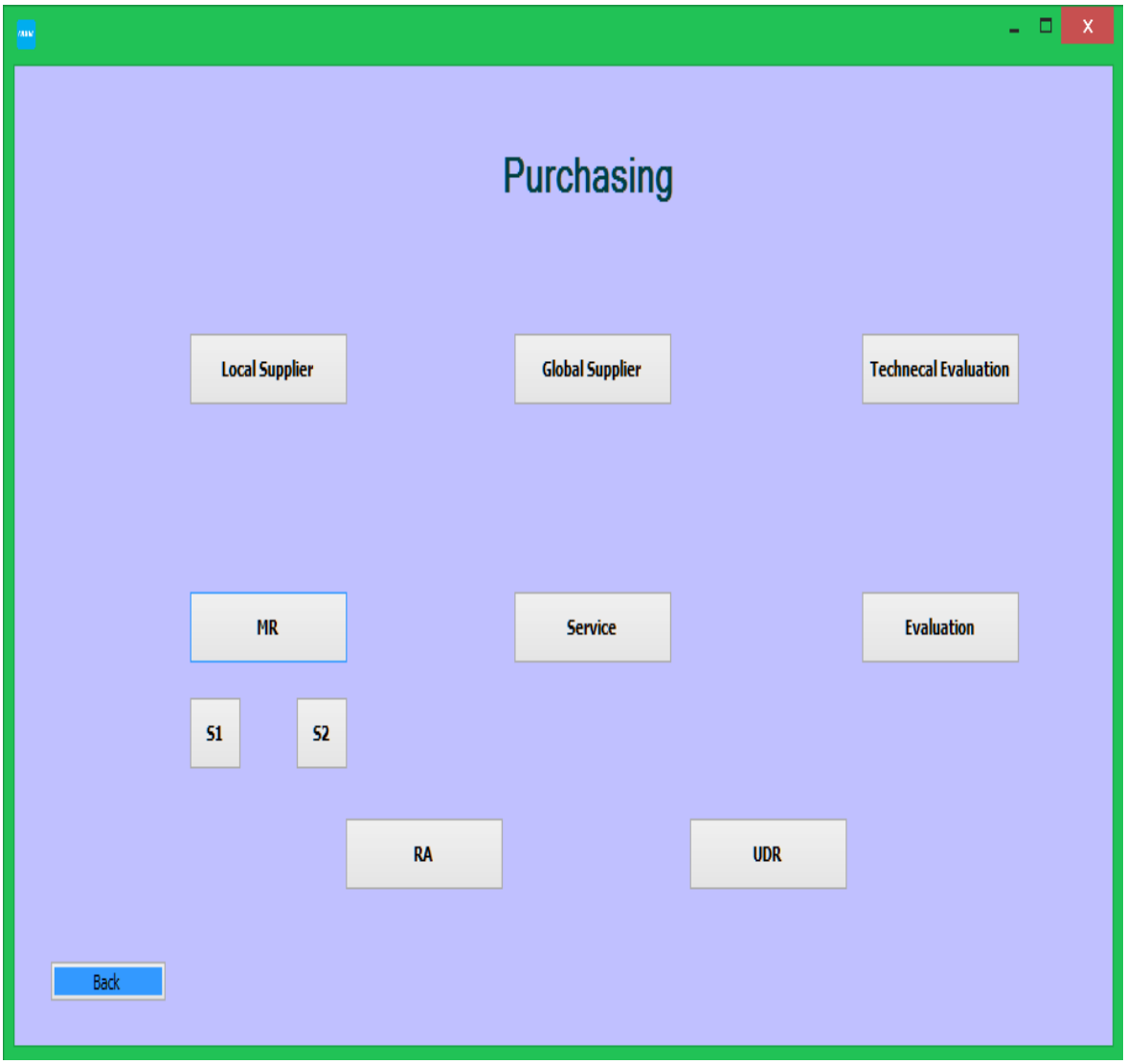

Figure 4.6: Material Requisition Form at purchasing component

4.5.5 Service

- Request For Quotation (RFQ)
- Purchasing Order (PO)
- Sole Source Authorization (SSR)

Figure 4.7: service at purchasing component

4.5.6 Registered Approved Vendors (RAV)

4.5.7 Urgent Demand Request (UDR)

4.5.8 Evaluation

- Technical Evaluation(TE)
- Commercial Evaluation(CE)
- Vendors Performance (VP)

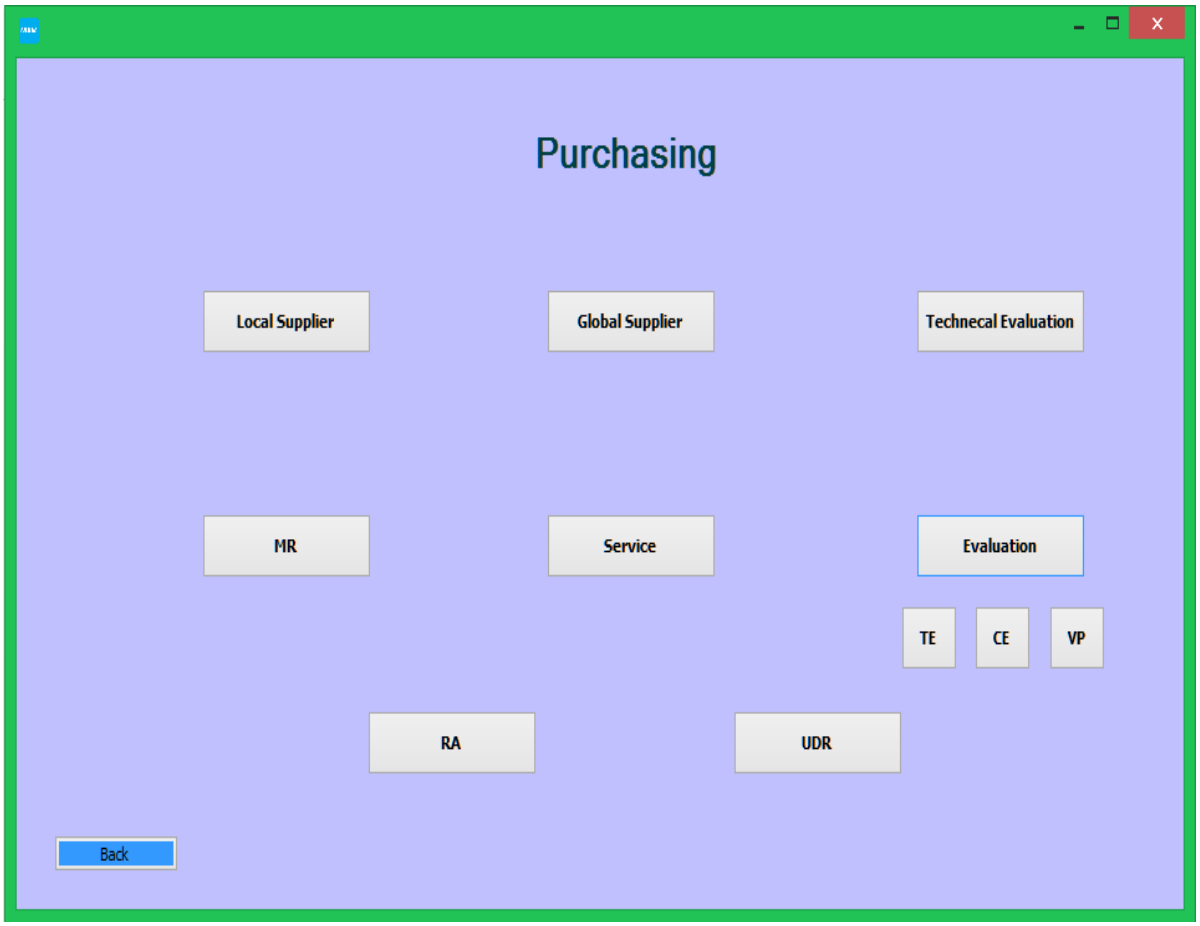

Figure 4.8: Evaluation at purchasing component

4.6 Inventory

4.6.1 Material Received Voucher

4.6.2 Material Issue Voucher

4.6.3 Material Transfer Voucher

4.6.4 Internal Material Request

4.6.5 Material Destroying Sell-out Request

4.6.6 Way Bill Form

4.6.7 Material Returned Back

4.6.8 Transfer Receive Voucher

4.6.9 Non-Conforming Product

4.6.10 Non-Conforming Material

Figure 4.9: Inventory component form

4.7 Contract

4.7.1 Contract Information Form (CIF)

4.7.2 Vendor Entry Data Sheet (VED)

4.7.3 Supply Categories (SC)

4.7.4 Vendor Application Form (RAV)

4.7.5 Registered Approved Vendors List (VAF)

4.7.6 Vendor Registration Procedure (VRP)

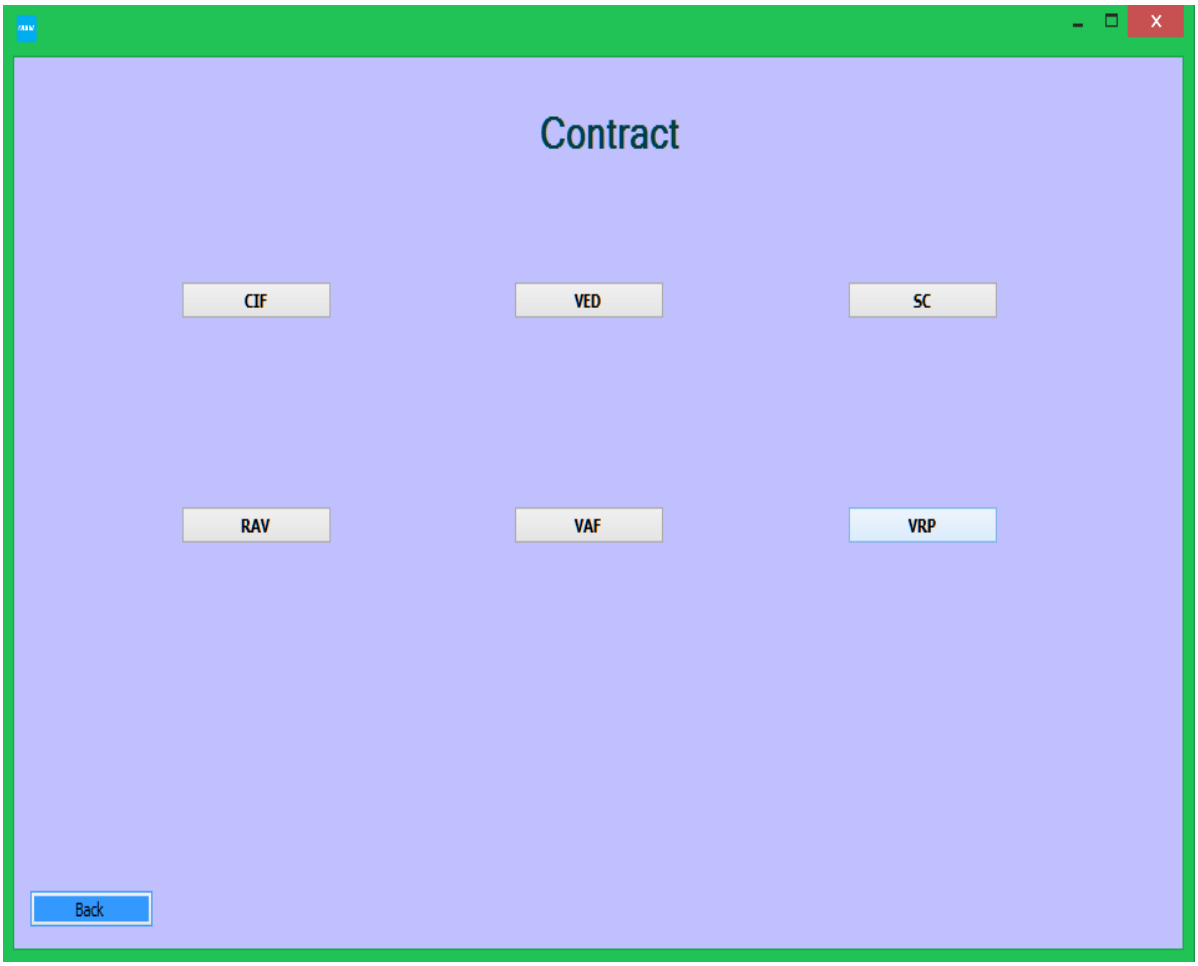

Figure 4.10: Contract component form

4.8 Logistic

4.8.1 Logistic and clearance status

4.8.2 Logistic Service Requisition

4.8.3 Inland Transportation Report (ITR)

4.8.4 Rig move report (RMR)

4.8.5 Logistics Work Order (LWO)

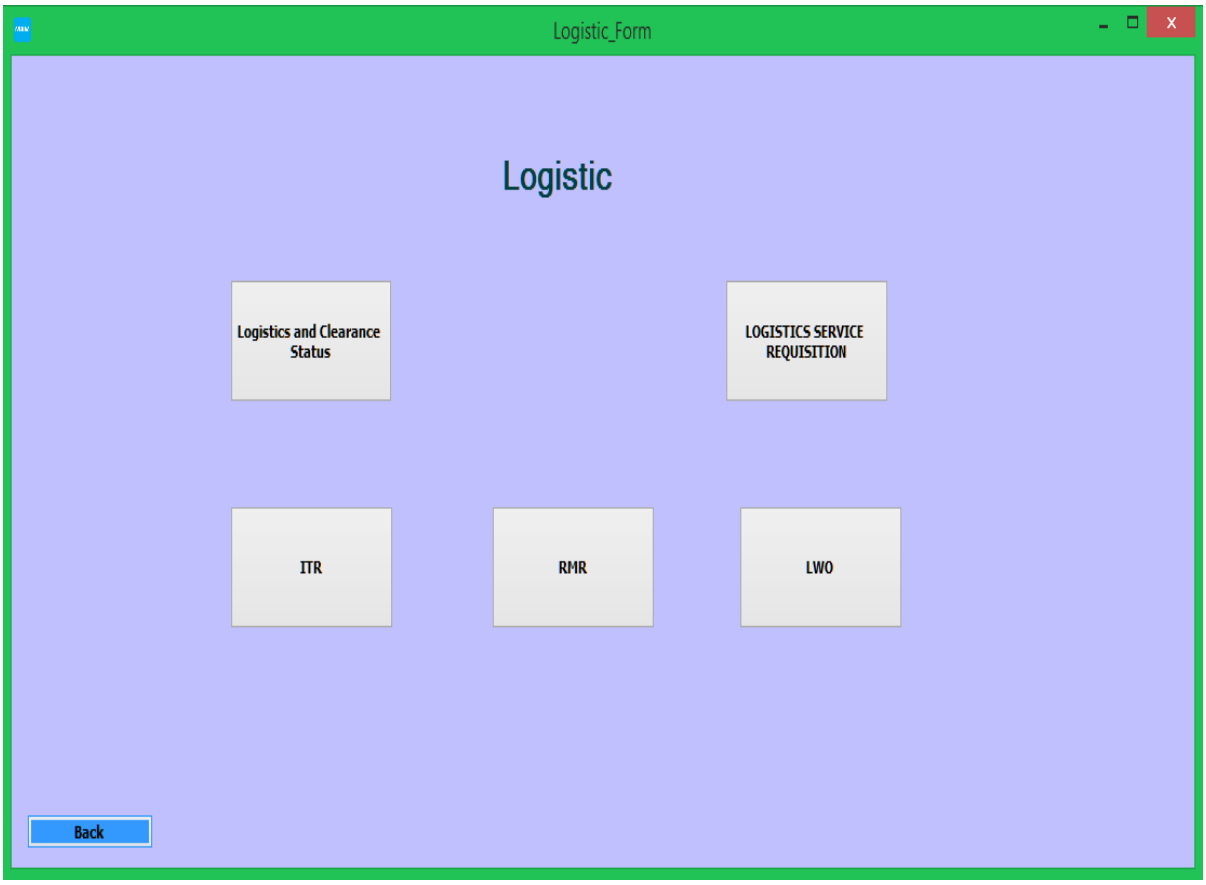

Figure 4.11: Logistic component form

CHAPTER FIVE

CONCLUTIONS AND RECOMMENDATIONS

5.1 CONCLUTION:

This project reviews built system for supply chain the system can deal with all the activities forms this form provide steps to complete and manage the jobs in every phase that obtaining the system flexibility and clear reporting status.

Engineering Request: ability to manage the request to guarantee the right.

Purchasing: proved all financial information to get the orders in best price description for the orders.

Contract: monitors supplier performance and delivery of supplier's products.

Logistics: modules cover transportation policy and responsibility.

Inventory: inventory management.

5.2 RECOMMENDATIONS:

1. Use Web-enabled platforms to allow supply chain partners to exchange information such as orders, forecasts, production plans, and inventory levels and fill rates via the Internet.
2. They can also include forecasting, customer relationship management (CRM) and supplier relationship management (SRM) modules to further integrate and coordinate information flow throughout the organization and beyond.
3. Add analytical applications, also known as execution systems or decision support systems, are applications that analyze the data from the MMA systems to provide managers with optimal solutions, given the appropriate resource constraints in terms of production, inventory and transportation, or even supply chain design. These applications can be "bolted" onto or integrated into MMA systems for added planning capability. They can be used to examine alternative strategies or scenarios and provide managers with the ability to make more informed decisions.

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5.4 APPENDIX: