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An analysis on E-Business in Manufacturing Logistics

[1]Jain Emadi
[1]Department of Mechanical Engineering, McMaster University, Ontario, Canada.
[1]jainmkemadi@hotmail.com

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Abstract – In manufacturing logistics, the selected software products and organizational processes provide reliable and suitable applications in Small and Medium-Sized Enterprises (SMEs). Nonetheless, because of the sudden change and enhancement of Information Systems (IS), some potential remedies are outdated and have to be reviewed and replaced with modern IS. As such, the Enterprise Resource Planning (ERP) frameworks can be considered as well. This paper evaluates E-Business in manufacturing logistics while reflecting advanced Supply Chain management (SCM) frameworks for SMEs, data mining and cloud computing. After evaluating the elements and issues of the change management in enterprises, this contribution focusses on Dynamic AX and Systeme Anwendungen Produkte (SAP) which is the ERP systems with reference to manufacturing logistics. In this business segment, the requirement for long-lasting and supporting remedies with technological application is fundamental. Currently, there is just a slight variation in technological application, but there is a significant change in how business flows in SMEs.

Keywords – Small and Medium-Sized Enterprises (SMEs); Information Systems (IS); Enterprise Resource Planning (ERP); Supply Chain management (SCM).

1. Introduction

Business entrepreneurs can possibly determine the business requirements for software transformation and management depending on certain business technologies, industry and function. This is the fact for Information Systems (IS) requirements of manufacturing logistics which necessitates the business practitioners to have the require experience and knowledge to initiate the required change. Since the advent of computers, IS has fundamentally played a critical role in business functions in Small and Medium-sized Enterprises (SMEs). During the early 1980s, IS had been evaluated and viewed as a critical instrument that enhances the implementation of strategic approaches.

Many researchers [1] have argued about the significance of IS which is viewed by SMEs as a strategic approach that enhances business performance. IS has allowed the establishment of novel firms, such as digital auctions and digital marketplace. Nonetheless, this significant impact has allowed SMEs to reconfigure the present opportunities that enhance competitive advantage. Apart from that, this has allowed markets to intensify competition and enhance business sustainability. IS influences the degree of competition in the market since it firstly changes the organization of the firm and transforms the principles of market competition. Secondly, IS can be utilized to establish business sustainability and competitive advantage which in return assures the firm of the required competitive tools. Thirdly, IS allows ventures to be developed within the SMEs' present activities.

In this aspect, IS application may be fundamental as a tool that permits SMEs to attain its strategic objectives due to its considerable information intensity in the value chains. In reference to researchers [2], the main tools for comprehending the impact of IS on SMEs is its value chain which defines the kind of activities through which services and products are established and provided to potential consumers. Whenever SMEs compete in business, there are some interlinked and discrete value-establishing activities being involved: sales force operation, product delivery, activities about the customers, channels and suppliers.

In reference to researchers in [3], the value chain is defined as a framework of interlinked activities of distributors, evaluating the expenses incurred in running enterprises and the production value provided to potential consumers. Since the activities incorporate the communication, processing, and creation of information, IS have significant impact on the value chains. The significant merit of IS include the capability to connect activities with each other in actual time. As such, the data formed during this moment is spread widely both in SMEs and the product distributors. In the modern age of IS, SMEs integrate IS in the process designs in means that affirm competitive advantage in the market. Organizational firms can potentially achieve competitive advantage by enhancing business effectiveness and finding strategic approaches i.e., doing things that are different from competitors to deliver value to consumers.

IS and E-Business frameworks have been proposed widely in literature. Two dimensions used to rate organizational models: innovation degree and functional integration are proposed as well. This incorporates the degree and relationship of externality which is the power of buyers and sellers. Researchers have evaluated the

major dimensions for categorization of business frameworks as follows: Bargaining power ownership (sellers and buyers); Innovation degree; Traffic scale; Cost/value offering; Value incorporation levels; Level of the essential security to verify and monitor system purchases; Economic controls; Customization levels; Pricing framework; Status of offering; Interaction patterns; and User roles [4].

Researchers have suggested a framework meant to compare and classify the organizational models. They have also exemplified the manner in which business processes can be translated with reference to organizational models into a category of fundamental measures for every element of the adopted model. The framework is grouped into four critical components.

- The collection of services and products which are provided by SMEs and the ones that signify substantial value to targeted clients (value proposition). This component signifies the value of enterprises that it provides to certain targeted segment. IS has an important impact on the novel approaches of delivering and creating value. Customization is a critical value proposition segment that is projected by researchers facilitated by the enhancements in IS.
- The connected capital and the enterprise maintain and creates potential clients to enhance the generation of revenues. IS provides a complete range of opportunities meant to exploit the present relationship with the consumers to develop and establish long-lasting relationship with them.
- The network and infrastructure of business partners are essential to create value and maintain effective relations in business.

Financial factors focus on the costs essential in enhancing productivity and adding value in the process of sales generation. The variation between the costs and revenues determines the profitability of the company. Four critical factors interact within the company and act as a core evaluative infrastructure which determines the innovation propensity that affects the process of decision-making by the business executives.

Individual factors influence the choice of business executive regarding how technological initiatives and knowledge management can be incorporated in business. Apart from that, the organizational factors affect the adoption of the factors that develop the quality of services and size of companies. The factors also determine the levels of specialization of companies and the intensity of data released by the business executives. Innovation and technological factors are also considered to incorporate the issues of costs, compatibility, complexity and innovation in business. Environmental factors are also fundamental since they affect the adoption of strategic means of dealing with competition in business, government policies and supply chain management.

Researchers in [5] attest to the fact that the four factors may affect the procedures of IS adoption. The organizational factors affect the resources and the organizational relationship with IS innovation. Environmental factors assure fundamental impetus for the business adoption, whereby the problems related to markets and completion influences technological application. Advancement in the adoption of IS within the company affects the functionality of the company hence enhancing profitability and productivity of firms. Individual factors incorporate the management factors attributed to firms hence boosting business performance.

The levels of IS adoption by companies have been addressed with reference to evolutionary procedures. The transformation of E-business for companies has widely been evaluated in literature. This transformation has highlighted the change in the usage of emailing, online store, website usage. The transformation of the firm represents the stages of evolution beginning from limited application of technology to complete incorporation of automated procedures in business. This contribution evaluates the Dynamic AX and Systeme Anwendungen Produkte (SAP) which are ERP systems with reference to manufacturing logistics. The remaining section of the paper is structured as follows: Section II provides the background analysis of the research whereas Section III is the literature review section. In Section IV, E-business in manufacturing logistics is critically evaluated. Lastly, Section V concludes the paper and provides future directions.

2. Background Analysis

SCM

The features and concept of SCM in E-Business ecosystem: distribution, marketing, planning, manufacturing and purchasing firms operates alongside supply chains. These lead to the fact that there are minimal integrated plans for the firms. SCM is viewed as a strategic approach which allows the strategic goals to be accomplished. SCM represents a network of distribution options and business facilities. It also performs the procurement functions of raw materials, finished products and intermediate products which also incorporates the distribution of products to consumers. Supply chains exists both in manufacturing and service firms.

SCM is normally visualized to fall between integrated companies where the flow of materials is controlled by a single company and the ones where the members of channels operate independently. The main purpose of SCM is to attain sustainability of business and competitive advantage. Figure 1 below shows a simplified supply chain model in E-business, since many SMEs have many customers and suppliers.

The supply chains in Figure 1 incorporate internalized supply chain elements, downstream distribution network and upstream supplier network. The logistic element develops the physical material flow from the producers of raw materials to the end-users, distributors and manufacturers. The internal supply chains of the focal manufacturing logistics incorporate distribution, sourcing and production. The purchasing of firms is obliged to select the distributors, discussing settlements, formulating the complete purchasing procedure lines and processes of

Corresponding author at: Jain Emadi, McMaster University, Ontario, Canada.

ordering. Change is fundamental in production and the transformation of raw materials, components and parts to finished products. Distribution is meant for the control of materials and how they flow from the producers to the customers.

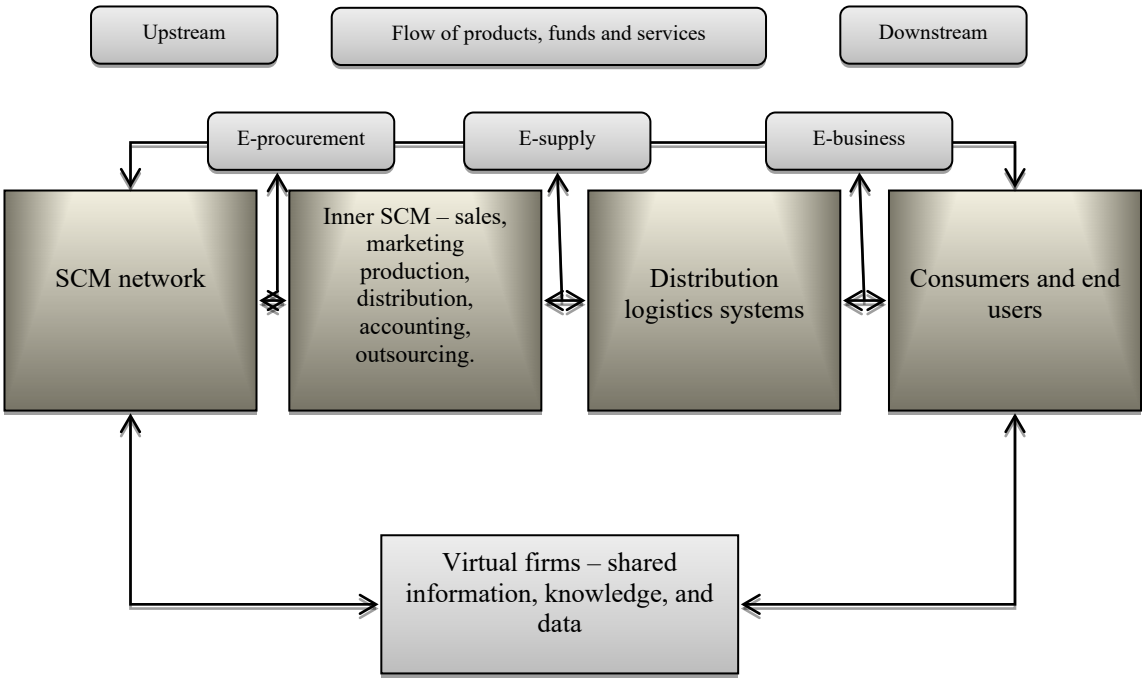

Fig 1. SCM in E-business

Enterprise Resource Planning (ERP)

ERP incorporates the complete firm's data systems and procedures which facilitate the storage of data regarding the functional segment, business units and production lines which incorporates the kind of decisions made by advanced managers. As a segment of IS infrastructure, ERP impacts the manner in which firms effectively control daily business operations and facilitates the effective flow of data among the process of the supply chain of companies.

The distributor network incorporates the various firms which provide materials and services. For example, an individual computer creator's distributor network incorporates the firms which give items that range from raw materials such as CPUs and plastic boards to items such as graphic boards and state disks. The distributor for motherboards might have their suppliers which provide inputs that are segment of the supply chains. The distributor networks are responsible for the real movement of raw materials between different geographical locations. Distribution management is obliged for the control and management of product packaging and dealing with materials at retail outlets and warehouses. The management of transportation is a critical segment of the distribution management that incorporates the management and selection of outer carriers or inner private carriers.

E-Business

E-Business utilizes advanced technologies to help business transactions in web-centered environments and this facilitates fund flow and data transaction flow. E-Business incorporates Business-to-Business (B2B), Business-to-Consumer (B2C) and Customer-to-Customer (C2C) transactions. E-Business is stimulated using wide-range electronic media. These incorporate electronic information interchange and electronic cost transfer where the sources of the supply chains are located.

E-procurement represents a solid segment of E-Commerce. This technological procurement process completely transforms the process of manufacturing and the distribution of products in the supply chain hence aiding in the process of facilitating seamless flow of materials from the manufacturers to the suppliers. With the advent of ERP frameworks, SCM has been brought to a significant integration level which incorporates significant activities and decisions. SCM was introduced in the early 1980s; however, this concept was significant earlier on in the 20th century. With the advent of electronic information interchange in the early 1060s and ERP in the early 1980s the support of the SCM functions was significantly featured. This timeframe changed in the 21st century with the advent of internet-based collaborative frameworks. The major objectives accomplished were cost evaluation and value addition through the process of integration. Supply chains can be grouped into stages as shown in Figure 2 below:

Corresponding author at: Jain Emadi, McMaster University, Ontario, Canada.

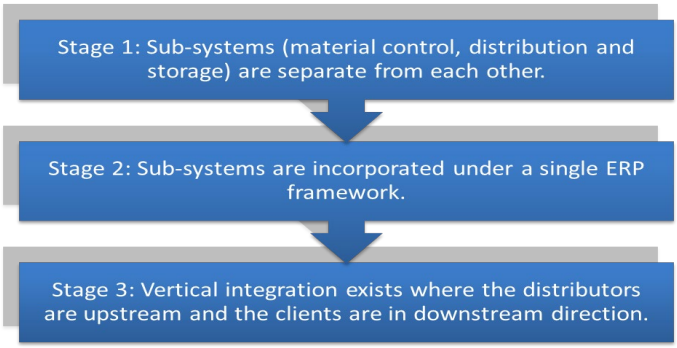

Fig 2. Stages of SCM

In the modern age, Web 2.0 presents novel challenges in IS which include the increment in data, online data transformation and collaboration between cloud computing, users and software-as-service. The major features of Web 2.0 are that is it assists in the process of navigating the data available in the internet. SCM embraces this feature with the assistance of operations in the supply chain. As web-based logistics frameworks are considerably common, they are likely to connect to the working ecosystem. Researchers in [6] refer this to the period of SCM 2.0. One of the major advantages of Web 2.0 is the advent of Asynchronous Java Script and XML (AJAX) technology. This technology incorporates web-centered applications which are capable of sending and retrieving data in the background without essentially distributing the present page.

AJAX is fundamental to the web-centered manufacturing logistics which makes these business segments easy to structure and develop. SAP Net-Weaver Portal is a technological advancement that has been initiated and based on the demands of information retrieval. The major advantage is that it eliminates the complete page-refresh and the page loads. Other essential benefits are minimal and based on network traffics because rendering is preceded to the side of the client that is the portal data which has been retrieved from the servers. For instance, Microsoft Company's Enterprise Portal-2009 is based on the AJAX technology and ASP network. In that regard, the advantages of utilizing AJAX are evident.

For instance, if you screen using the command button and the edit box, writing program codes for the buttons is based on the clicks and the buttons of the complete page which possibly refreshes. However, in case the same control is loaded using the dynamics AX user-control web segment, AJAX is updated and utilized based on the edit box without necessarily refreshing the complete page.

3. Research Methodology

According to researchers in [7], the bullwhip effect is fundamental since it provides the data about the distribution channels of the manufacturing logistics. This concept denotes to the trends of larger swings in inventory responses to transform the demands as someone looks at the firms further in the supply chains regarding specific products. This concept appeared firstly in the industrial dynamics and therefore is known as a Forrester effect. Since customer demand is rarely stable, businesses have to project the demands to effectively position the resources and inventories [8]. Projections are centered on the statistical methodologies that are barely accurate. Due to the fact that some projections forecast errors, forms carry inventory buffers that are known as safety stock.

As individuals shift up the supply chains from the end-consumers to raw materials distributor, every actor in the supply chains has significant observed various which are in demand and therefore greater necessity for safety stock is assured. Another core purpose is batch ordering that is an effective sample for local optimization. As for practice ordering in complete trucks, loads are cheaper compared to typically ordering smaller amounts of loads. Psychology based on ordering is meant to eliminate the deficiency of inventories in periods of the rising demands which are falling. The results are amplified when individuals shift upstream in the supply chains (away from the consumers).

SCM data is valuable whenever it is critically evaluated mostly when the process of analysis focusses widely on the enterprise. This form of integrated perception was neither easy or common until recently when data platforms such as Dynamics AX and SAP started providing modules which may provide BI remedies incorporated with SCM modules [9]. Many SCM applications are definitely operating on a dashboard to incorporate into the BI layers. Moreover, the platform vendors such as Microsoft and SAP have identified the necessity to have B2B intelligence over the various systems. Irrespective of the fact that CRM and ERP have provided effective and enhanced operational systems, the management find that they are still running out of time and accurate data about the organization. Some of the sole purpose because CRM and ERP systems have basically failed to establish effective firms' analytics and reporting include: the idea of systems being incorporated over the enterprise data model as defined in [10]. The model is incorporated as a standalone turnkey framework founded on top of the various models.

Business definitions and protocols, according to researchers in [11] are not enforced and defined over the

Corresponding author at: Jain Emadi, McMaster University, Ontario, Canada.

firm. Instead, they are based on every individual model. During the process of customization, poor databases and their design leaves information elements unidentified to the users of business and the data integrity is affected and the transactional models are not formulated to support the efficient analysis and reporting. Many implementations of the supply chains are constrained using these problems. The logical assumption from this is that SCM models will not be able to deliver the projected values to the firm. Critically, firm's Business Intelligence (BI) models have to structure data from the various operational models. Due to the fact that the success of the BI models is significantly based on the capacity of operational models to provide crucial firm's data.

BI models are dependent on the capacity of the operational frameworks to provide fundamental BI models at an actual-time as a necessity for the SCM model. If this is not the case, fundamental rework will therefore be fundamental to retrofit the various BI necessities into the SCM model. SCM therefore establishes a logical avenue to benefit from the upcoming generation of BI and mobile applications [12]. As the makers of products are worried about the structuring of application to operate faster and stock inventories from the store, mobile applications and BI project on making SCM operation significantly learner whereas promising to mitigate the issue promptly. Many influencers of the evident delayed in SCM are unique occurrences such as production issues or parts shortage. The mobile devices that are owned by customers can be applicable in the process of addressing the unscheduled events by retrieving individual data required to mitigate the potential issues in the organization.

Whereas various firms have established an effective electronic information interchange association with the application of the cloud-centered remedies, the complete market has not applied smart mobile applications. In the modern age, smartphones have the required computing capacity to operate business applications with the advent of the 3rd generation of mobile networks, the accessibility of the internet is promptly enough. There are firms providing potential remedies for SCM applications and electronic invoicing for Windows Mobile 7, Android, iPad and iPhone devices [13]. With the introduction of Windows Mobile 8, many firm level functions such as the encryption of virtual data systems and prompt accessibility of remote databases will make mobile systems to be appealing to the mobile applications. The remedies incorporate the reporting of the inventories and the electronic invoicing for mobile tracking, delivery tracking, carriage ordering, delivery proof, point-of-sale and stock-out tracking visibility through Windows Mobile 7 and 8, Apple iPad and iPhone and Android devices.

4. E-Business in Manufacturing Logistics

E-Logistics

E-logistics can be viewed as the services which focus on the inefficiency in the sector of transportation. This critically involves the goods and how they are ordered online and how they can be delivered to the consumers in a timely manner. The services may incorporate some reporting and communication processes which also include order management, tracking, shipment and order entry.

Another critical aspect is that e-logistics are considerably a wide-range and integration of the supply chain which significantly includes the elimination of the intermediaries such as retailers and wholesalers) which significantly fosters the advent of novel players in business. These plays include the logisticians whose basic obligation is to apply the traditional chains of logistics to consider the essential needs of e-business. If this is investigated closely, e-logistics are in support of establishing business with B2B and B2C through online platforms. If we purpose to apply logistics approaches in firms, the processes of handling business will be re-invented. The process of re-invention is basis for the application of e-logistics through the processes of logistics and the essential results will prove to be fundamental for the supply chain. To operate appropriate flow of data from the clients to the distributors, all the information is required online with the manufacturing logistics.

E-Logistics in SCM

Traditional initiatives support the relationships between SCM and the electronic information interchange models. In reference to the core explanation, the electronic information interchange is the inter-business process and the organizational partnership that have been proved to be fundamental when it comes to the usage and adoption of electronic information interchange. The traditional method of SCM incorporates the application of computers in the electronic information interchange models which necessitate state-of-the-art technological expenditure. However, in the electronic SCM environment the expenses of data exchange with supply chains are significantly minimized.

The strategic flow of resources and materials include the relevant performers such as consumers, retailers, wholesalers, manufacturers and suppliers. Eliminating an essential element of the supply chain is a fundamental step. For instance, the retailing sector can be removed and the products be transferred from the customers. Another critical step in the forward train is to remove the manufacturers and wholesalers that are in connection to the consumers. In case the retailing sector wants to maintain its position with e-logistics, they should be able to provide higher dimensions of services that are soluble as a forward moving train. If the retailing sector is not capable of dealing with this issue and the owners focus on eliminating the retailers and manufacturers from the supply chains, they have to encounter various situations and complete tasks to substitute a number of functions that were started by the suppliers. The major elements of the functions include delivery, transportation and storage interaction with consumers. Another critical task incorporates quicker and punctual services that imply a different approach of customer articulation.

Corresponding author at: Jain Emadi, McMaster University, Ontario, Canada.

ERP – IS Models in Manufacturing Logistics
Systeme, Anwendungen, Produkte (SAP) SCM
SAP is considered as a fundamental factor that influences technological application in manufacturing logistics. This factor is fundamental for business management of services and application of software remedies for enhancing organizational processes. SAP, following its advent from Germany represents system application, products and software that was originally developed and designed by five IBM experts during the early 1970s with the aim of being viewed as a standardized software application for structured ERP software. SAP has been considered as a critical frontline ERP software since its advent. SAP in SCM have the functionalities detailed in Fig 3 below.

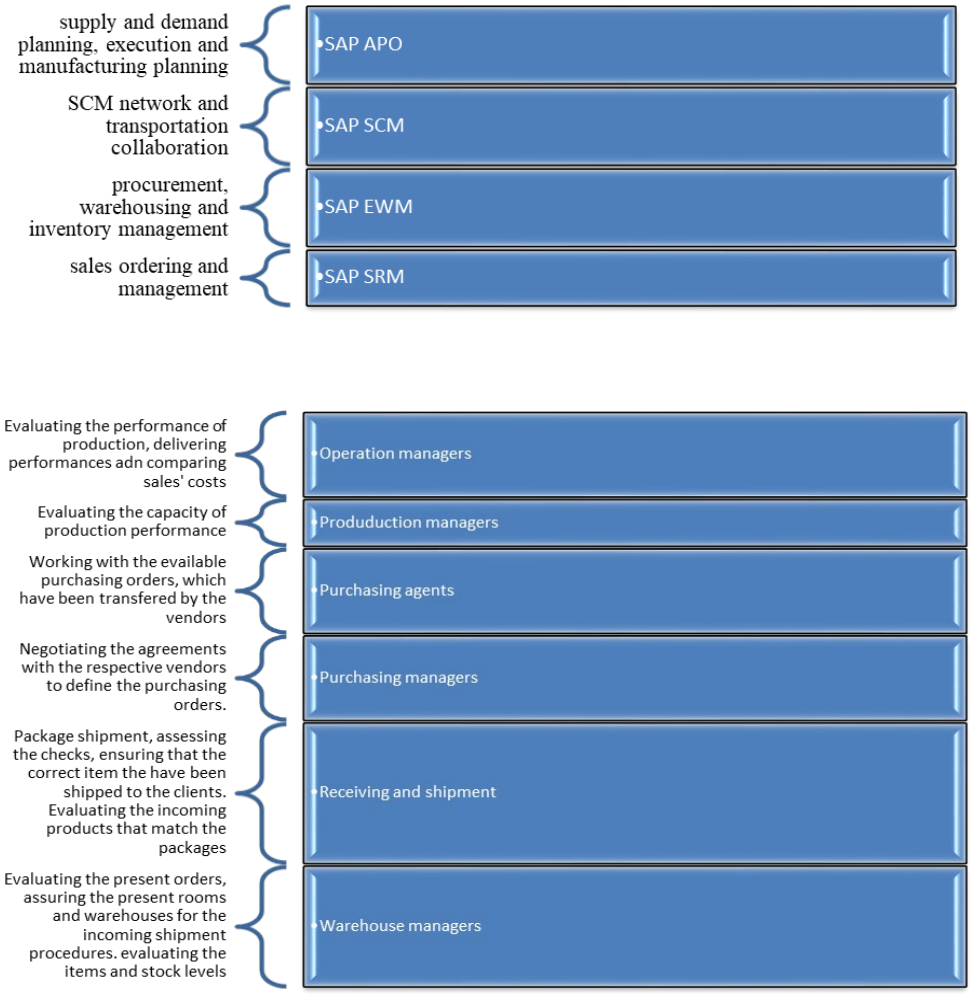

Fig 3. Functionalities of SAP in SCM

SAP SCM is considered as a fundamental segment of the business suite and provides the consolidated perspective of the procurement and pay procedure that incorporates purchasing information from the SAP ERP applications. SAP Supply Resource Management (SRM) has the functionalities such as operation procurement, supplier collaboration operational reporting, supplier evaluation, centralized contracts, catalogue management, plan-based procurement, centralized sourcing, self-service procurement and service procurement. SAP SCM incorporates advanced optimization and planning, replenishment and forecasting, inventory collaboration hub, event control, extended warehousing control and the SCM network collaboration.

SAP SCM is a fundamental segment of the business suite software and it is referenced from the NetWeaver model. SAP SCM makes use of a significantly complex but logical approach of handling SCM challenges. In the various SAP SCM modules, certain steps are followed. The complete process begins from the process of forecasting the future demand planning sales. Minor steps incorporate the following: releasing forecasting for the distributed planning, monitoring the accuracy of forecasting, adjusting forecasting, launching statistical forecasting, cleaning historical exceptional events and uploading novel product information.

The optimum quantities of products to be availed in the SCM network of the firms is determined by the SCM planning in the network. Its purpose is to structure the

Corresponding author at: Jain Emadi, McMaster University, Ontario, Canada.

transfer of stocks required between various locations (warehouses and factories) to accomplish the required level of target stock and accomplish the demands of every location. This plan amounts to the demands to apply the ideal production scheduling and production plan. The objective is to evaluate the optimal quantities, evaluate the stocks which incorporates the product set-up time (which is the lost time when developing products). After evaluating the requirements of the firm (sales and forecast orders, or stock exchange to the warehouses) the firm's target level of the stocks and the product constraint is based on production planning. This determines how much products should be produced in the product line. This is determined for the finished goods and after this intermediary of the semi-completed products.

Microsoft Dynamics AX – SCM

The Microsoft AX which was introduced in 2009 links the purchasing and sales process with warehouse, logistics and production management to supply actual-time visibility in the entire supply chain. This has the capacity to incorporate the external business procedures and support the required application connection which allows owners of the manufacturing logistics to optimize the levels of inventory and enhance the rates of reliability for delivery and execution process. Moreover, it is possible for one to aid in the process of simplifying corporate governance commitment through the definition of custom organizational workflows and rules in reference to risk scenarios. In Microsoft Dynamics AX, SCM focuses on functionalities such as interfirm trade, inventory control, procurement control, vendor self-service portals, B2B trade partner agreement, tracking and reservation, return management and distribution planning, demand forecasting and order promising.

The remedies of Dynamics AX in SCM on the web services utilize XML documents. It is possible to streamline and automate business procedures and formulate special Web services. The services of payment can make use of the integrated processing of credit cards authorization and preauthorization which potentially enhances the tracking of data to the Dynamic AX. Actual-time information can be retrieved through the web-based portals such as Sharepoint servers with organizational logistics preserved in a single set of data to assure the security and integrity of data.

The roles below support the functions of SCM: purchasing agents, purchasing managers, receiving and shipping, shop supervision, product management, operation management, warehouse workers and warehouse managers. The BI tools incorporate the fundamental indicators of performance ad-hoc reports and standard reporting which can evaluate the performance and create strategies that utilize the predefined cubes of decisions. Information can be transferred to Visio and Excel. The management of sales proceeds beyond the order management process but incorporates credit limit checking, inventory level and pricing calculation which critically provides the makers of decisions with actual-time data.

5. Conclusion and Future Directions

This paper has provided an analysis of SCM with respect to IS. SCM makes use of wide-range BI tools which incorporates the tradition database management frameworks and applications of data mining. The transformation of technology impacts this segment less. However, its gradual development can be seen from the centers of computing which strategizes establishing flexible solutions in mobile technology. This paper has evaluated the SAP SCM and Dynamic AX systems which have been introduced in enterprises. These systems cover the same functions, but with a different approach. From this contribution, SAP has been seen to be firmer when it comes to strategic organization hence providing sophisticated network planning tools for enterprises. The variations originate from the variant consumers of products; their clients vary depending of the size of the firm and the location of the company. The two systems present a state-of-the-art technology just like BI, mobile solution and cloud computing tools. The traditional value of ERP system is not just based on the support and maintenance of the long-lasting remedies, but in providing the latest technological advancements too. Future research should focus on the latest approach to apply SAP SCM and Dynamic AX systems in SMEs. The research should be based on evaluating the differences between these two novel systems that affect the flow of business in SMEs.

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