The Role of Technology in Enhancing Corporate Performance

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Abstract
Technology has significantly evolved and it has greatly been adopted in many organizations irrespective of their sizes. Technologies that support business operations are being used by very many medium sized and large organizations across the world as they try to improve operations and gain a competitive advantage. Opportunities for enhancing efficiency and effectiveness can be identified through examination of the various technologies in a typical modern organization. Many organizations are fast realizing that technology is the most important resource in creating a sustainable competitive advantage. This paper is a narrative review seeking to establish the role of technology in enhancing corporate performance. The research found out that many companies worldwide have made remarkable strides towards technology adoption. However, there is still enormous untapped potential due to huge investments required in technology management. Finally the research gives some conclusions and recommendations which will be very helpful to both practitioners and researchers.

Key Words
Technology, Corporate Performance, Efficiency, Effectiveness

I. Introduction
Traditional firms mainly focussed on the flow of products, but the emphasis has greatly changed to include information flow and the accuracy of the information (Bowersox et. al. 2007). Firms are currently in great need of information for performance because it enables the managers to make more informed and better decisions. Such information covers customers’ demand, inventory levels, production and shipments and it can only be availed through the use of the right technologies. This helps them to optimise the flow of materials throughout the supply chain and to the right destinations.

Information should be provided on end customers’ demand simultaneously to enable all the members of a particular supply chain to plan their production in response to actual supply requirements with great accuracy and therefore avoiding the bullwhip (forrester) effect which occurs as a result of the lack of information. The right technologies within an industry are highly required for accuracy and timeliness and therefore organizations must ensure that they have the right systems for gathering, analysing and exchanging information (ITC, 2006).

Sople (2010) explains that using information more effectively is the single most important source of competitive advantage for firms today. Information systems are therefore important for competitiveness and they range from tactical systems (used for managing the daily and routine operations) to strategic systems that are used for facilitating development and implementation of long term strategies.

The management of any company has to deliver tangible results. They should mobilize their employees and other resources through a process that describes the company’s strategy in understandable measurable terms, so that they all understand how they can contribute. Measures or key performance indicators are chosen to demonstrate how well the company is progressing in its strategy execution. Companies are now implementing broad based measure of performance and Brown and Franco (2003), explain the characteristics of good performance measurement as: broad based measures; structured understanding of strategy; providing feedback on performance and taking action on results. It is also advisable for managers to bear in mind the following aspects when deciding measurement systems: be selective and do not use too many measures; focus on what should rather than what can be measured; do not simply reformat existing measures; create models of the business to illustrate the rationale for the measures.

II. Theoretical Perspective
Badawy (1998) explains that global perspective strategies are increasingly becoming technology driven in the context of extremely dynamic, high velocity and turbulent environments.

Managers should therefore get a better understanding of the technologies they are implementing and developing and have a clear vision of the role of technology in their corporate strategy.

The managers must also control the impact of technology on marketing, finance and human resources function of the firm.

Technology management can therefore be seen as the practice of integrating technology strategy with business strategy, contributing to enlarging the conventional definition when stating that such integration requires the coordination of research and design, manufacturing and other service functions.

The management of technology links engineering, science and management of disciplines to plan, develop and implement technological capabilities to shape and accomplish the strategic and operational objectives of an organization. The management of technology developed in the mid 1980s and according to the National research Council (1987), management of technology is an intersection of two scientific disciplines, which allow the merging of technical and managerial competencies.

Technology management involves three major elements: resources (human resources, funds, equipment, information and technological result), organization (organizational structure and culture), and quality (technological quality, standardization and technological risk) (Yu et al., 2003) Miyazaki and Kijima (2000); Gaimon (2008) explain that the three elements of technology management are closely related to and interact with each other dynamically.

The relationship between them is non-linear, which strengthens the complexity of technology management system. Changes of one element will greatly affect conditions of the other two. Identifying key technological activities and problems in technology is an important task for all managers. All behaviours of technology management elements should be taken into consideration, and
by benchmarking, managers can find out problems in technology management and provide directions for improving organizational efficiency and effectiveness.

Acceptance of technology is also important for organizational performance because it depends on the user’s assessment of the influencing constructs as depicted in Technology Acceptance Model (TAM) and Theory of Planned Behaviour (TPB). The Technology Acceptance Model (TAM) was developed by Fred Davis and Richard Bagozzi. TAM assumes that the fundamental determinants of IT adoption are utilitarian based (Natour and Benbasat, 2009); He (2006) informed by the technology’s perceived usefulness in the business operations and its perceived ease of use/application. Bagozzi (2007) explains that these two constructs provide the bases for attitudes towards a particular technology, which in turn determine use intentions, and then build actual usage pattern. Perceived usefulness measure the extent to which a person or an organization believes that using a particular technology enhances operational outcomes where as perceived ease of use/application measures the extent that investment in technology alters mental effortlessness.

The Theory of Planned Behaviour (TPB), developed by Ajzen in 1991 sought to expand and enrich TAM by adding usage of IS and placing premiums on specific settings and external variables that influence the adoption process of a technology. Other constructs added were perceived service quality and perceived trust (Chen and Tan, 2003); organizational readiness and external pressures, cost leadership and enhanced services positioning, funding, innovation, workforce management, and information management vision, value recognition, technical ability, and control (Grandon and Pearson, 2004)

III. Methodology

This paper is a narrative review article on the role of technology in enhancing corporate performance. Narrative literature review articles have an important role in continuing education, because they provide readers with up-to-date knowledge about a specific topic (Clarke & Oxman, 2006). The study focuses on mechanised technology and information technology, with an emphasis on information systems. Literature related to the subject matter is analyzed from secondary sources, including publications and unpublished work.

IV. Technology and Corporate Performance

Technology is the making, usage and knowledge of tools, techniques, crafts, systems or methods of organization in order to solve a problem or serve some purpose. IT includes the hardware, software, databases, networks and other electronic devices. When computers and communications technology are combined, the results is information technology (Ken et al., 2010). This therefore means that technology can either be mechanised technology or information technology. Mechanisation is basically the process of doing work with machinery, while information technology is majorly composed of several information systems such as the decision support systems (DSS), Executive support systems (ESS), and Enterprise resource planning systems (ERP). Others include the artificial intelligence systems the expert systems (ES), transaction processing systems (TPS), and electronic data interchange (EDI) and the internet. Corporate performance can be best measured through customer service delivery levels and operational cost reduction, and many authors have also described organizational performance inform of financial and non-financial performance. Three common measures of performance are used when evaluating performance: efficiency, responsiveness and effectiveness (Chase et al., 2001). Efficiency implies minimization of total system wide costs from transportation and distribution to inventories of raw materials, work in process and finished goods. To be efficient, firms should utilize strategies aimed at creating highest cost efficiency and for such efficiencies to be achieved, non-value adding activities should be eliminated, economies of scale pursued and optimization techniques deployed so as to get the best utilization capacity.

A. Decision Support Systems

The decision support systems use data from the internal sources such as databases, data warehouses and data marts of external sources to model possible features. The nature of DSS tools have changed significantly. Today’s DSS are equipped with a variety of tools such as graphics, visual interactive modelling, artificial intelligence techniques, fuzzy sets and genetic algorithms. Nemhauser (1993) stated that the combination of remarkable advances in algorithms and computers has made it possible to solve linear and integer programs with greater speeds. Many new tools that are emerging in DSS area are becoming an integral part of a set recent development in data management, and these tools are reshaping DSS developments in many organizations. DSS have contributed considerably towards the utilization of information processing systems in organizations. DSS supports decision making and attempts are being made to broaden the level of decision support to enhance organizational performance. The decision support systems help managers make decisions by providing information, models or analytical tools, and they can be widely applied and used across many functions in an organization (Murphy et al., 2008). Many DSS techniques are used in organizations and they include simulation, artificial intelligence and the application specific software. Murphy (2008) further explains that simulation involves a computer model that is a series of mathematical relationships often expressed as a series of linear equations. The primary advantage of simulations is that it enables the firm to test the feasibility of proposed changes at relatively little expense. It also prevents the firm from experiencing the public embarrassment of making a major change in their logistics system that might result in a deterioration of customer service levels or an increase in total operating expense. The artificial intelligence is a branch of computer science that studies the computational requirements for tasks such as perception, reasoning and learning, and develops systems to perform these tasks. The third type of DSS is what can be broadly called application-specific software, which has been developed to help managers deal with specific functions or activities. This software can focus on either planning or operational (execution) capabilities and includes, but not limited to supply chain management and order processing (Leake, 2002)

B. Enterprise Resource Planning

According to Ken et al. (2010), ERP is a business system that, supported by multi-module application software integrates all the departments or functions of an enterprise. ERP is applicable to all organizations and allows managers to have a consolidated view of what is taking place throughout the organization. Most of ERP systems are designed around a number of modules, each of which can be stand alone or combined with others. Some of the modules are finance, logistics, manufacturing, supplier management and
Human Resources Management. ERP systems collect data from various key business processes in manufacturing and production, finance and accounting, sales and marketing, and human resources and storing the data in a single central data repository. Information that was previously fragmented in different systems can be easily shared across the firm to help different parts of the business work more closely together. For example, when a customer places an order, the data flow automatically to other parts of the company that are affected by them. The order transaction triggers the warehouse to pick the ordered products and schedule shipment. The warehouse informs the factory to replenish whatever has been depleted. The accounting department is notified to send the customer an invoice.

Customer service representatives track the progress of the order through every step to inform customers about the status of their orders. Improved coordination between these different parts of the business lowers costs while increasing customer satisfaction (Ken et al, 2010). Initially, ERP systems were enterprise-centric. The development of the internet and e-business has, however, made the sharing of accurate real-time information across the whole supply chain essential to business success. (Lysons and Farrington, 2006). Even though implementation of an ERP system is viewed as costly, time-consuming, risky, and challenging (Bingi et al 1999, Booth et al 2002), many organizations have introduced them. Some are embarking on the next wave of web-enabled ERP systems with decision-support capabilities; others are consolidating and attempting to derive the promised benefits.

While some of the consequences of ERP systems could become apparent immediately, others come to the surface only after a relatively long period. Given the time required for learning and adjustment, it will normally take several years to realize the full benefits of any information technology-based innovation (Willcocks and Ixter 1999). First-generation ERP systems were viewed as IT projects and considered “complete” when they went live; in contrast, second-generation ERP systems are treated as business projects (Brown and Vessey, 2003). While the benefits of ERP systems are not disputed, it is considered difficult to separate them from the effect of other organizational and IT changes (Staehr et al. 2002).

In today’s world, most organizations are becoming customer-centric and customer-responsive, and thus they use business intelligence information systems like ERP to help attain the expected benefits (Balsmeier and Nagar, 2002). They argue that ERP software must address all the enterprise needs of an organization within the social context in which the enterprise operates which includes the local accounting practices, customs, sales tax, and income tax. As per Frost and Sullivan (2008), it has been found that due to rising competitive pressure, many Indian companies are looking forward to equip themselves with modern business processes like ERP solutions that can further provide unlimited access to information and enable them to compete effectively.

Katerrattanakul et al. (2006) studied ERP systems in Korean manufacturing firms and inform that the area most benefited from the ERP implementation were the availability and quality of information and integration of business operation/processes. On the other hand, the area that least benefited from ERP systems were IT costs and personnel management. Compared to Shang and Seddon (2002) five-dimensional ERP benefits, they found that operational benefits come first, managerial benefits follow, while IT infrastructure benefits are in third position. Besides, they argue that the Korean manufacturing firms do not show any strategic or organizational benefits. Spathis and Ananiadis (2005) observed that ERP systems significantly contribute towards increased flexibility in information provision and improved decision-making when they examined the impact of decisions on the accounting and information management implemented in a large public university in Greece. They conclude that the implementation of ERP system show that managerial benefits come first, operational benefits follow, while IT infrastructure benefits are in third position. This order of benefits is slightly different from Shang and Seddon (2002).

C. Executive Support Systems

An executive support system is an interactive computer system that provides business executives with the capability to obtain easy access to internal and external information relevant to decision making and other managerial actions. EIS is based on the assumption that more reliable and timely information makes for better decisions, and that better decisions make for better, healthier businesses. By combining numerous software applications, EIS puts a full array of powerful, analytical and business decision tools at the executive’s fingertips. It translates vast amounts of hard data into easy-to-understand graphs, charts, and short explanations, thus providing executives with instant and automatic access to information that is relevant to their needs. Executive information systems provide better mental models for executive decision making. Although it is not as easily quantifiable as savings in time or increase in productivity, this benefit is perhaps one of the greatest and most immediately visible. Using various components of EIS, the executive can transform data to play out various decision alternatives and business scenarios to determine what the effects of certain decisions would be. This is particularly useful for confidential decision making (Beheshenti, 2005).

D. Expert Systems

The expert systems are intended to mimic human expertise in a specialized area. They consist of knowledge, inference engine and user interface and they tend to be used to augment rather than replace the human element. The perceived potential of expert systems has consistently led to the prediction that a user of such a system is provided a competitive advantage, which is a powerful tool. The general consensus among many scholars is that properly positioned information technologies, and specifically expert systems, have a positive impact on the firm’s competitive advantage. Thus, the expert system creates a differential advantage through the leveraging of resources. The overall acceptance of information technology and expert systems was initially low among organizations but approval levels have escalated significantly and they are used by firms for improved decisions and negotiation (Robert et al., 2003).

Eppinette et al. (1997) explain that the expert systems have the ability to come to a conclusion, and to come to the same conclusion given the same input time and time again, which makes them so applicable to the delivery of service. Also, expert systems allow the inclusion of uncertain or incomplete information into the decision making process, thus more fully mimicking the human decision making process. They further argue that Expert systems could be set up so that customers dial a number and communicate via touch-tone phone, or perhaps even a computer bulletin board where the customer could contact the expert system via a modem. With more computers now making use of graphical user interfaces, the level of sophistication required of the customer would be very low, allowing potential use to be very widespread.
According to Vaidyanathan and Rajesh (1997), expert systems are perceived to be an important tool for decision analysis. To understand and appreciate expert systems better, it is vital to understand decision analysis, its supporting elements and its role in the decision-making process. The expert systems play a key role as a tool to enhance productivity, improve quality and increase profits while minimizing costs and capturing expertise in many business and industrial environments. However, one of the main reasons why many expert systems fail to be integrated into the operational environment is a lack of knowledge and technique on how to develop, test and implement expert systems efficiently. Production and operations management is a very fertile application area for expert systems owing to its heavy orientation towards decision analysis and problem solving. Past research in expert systems application to production and operations management have been minimal owing to the paucity of information that exists on expert system’s application in production and operations management within an organizational context.

E. Electronic Data Interchange (EDI)

EDI is a new emerging technology used for transfer of business documents from one computer to another. Traditionally, business documents such as invoices, cheques and drawings are sent through mail, fax or courier. However with EDI, these documents are transferred electronically from one organization to another. In short, EDI is a drive towards paperless document transfer or transactions. EDI will emerge in strategic areas such as provision of better levels of customer service and improved marketing competitiveness. EDI is a computer-to-computer communication using the same language and this cannot be achieved unless the two computers have the same communication standard. The standard includes: matching of data transmission speed; data coding and decoding system; matching of hardware of the computers. Usage of EDI in the area of inbound logistics between the manufacturer and supplier will ensure substantial saving on transaction cost for both the parties. Similarly, using EDI between the manufacturer and the customer will ensure reduction in the order cycle time and inventory, which will help the customer to enhance his competitiveness. Thus, the sharing of the benefits of EDI by both seller and buyer will result in creation of a partnership spirit leading to high switching cost for the customer and creating barriers for competitors. Today, EDI is widely used in banks, marketing, customs, logistics and finance companies, as well as in international trade in the developed countries. (Sopie, 2010). It is therefore evident that EDI has a number of benefits, including reductions in document preparation, and processing time, inventory carrying costs, information float, shipping errors, returned goods, lead times, order cycle times and ordering costs.

F. The Internet

The internet including email is rapidly becoming a business communication system of choice. The internet is a low cost method for sharing information both internally (intranets) and externally (extranets). More companies are looking at the internet as the most useful system to communicate with shippers and suppliers, at it provides virtually instant communication. The internet by facilitating electronic applications may change the relationship between different members of a channel, i.e. supplier, manufacturer, wholesaler, retailer and consumer. (John, 2009).

Most communication systems are internet based and they help various stakeholders. Employees, suppliers and customers work together by interacting and sharing information in many forms. Such systems that are internet based include wireless communication, global positions systems, voice based order picking systems and they help an organization communicate effectively with it customers and suppliers (Murphy et al., 2008).

V. Role of Technology in Specific Organizational Functions

The role of technology can also be discussed depending on how the technology is used in performing different activities in specific functions/departments of an organization as discussed in the following section.

A. Marketing

According to Bruce et al., (1996), marketing is continuously influenced by technology and marketers who do not adapt to this new technological era will not survive. The benefits of information technology to must centre on successful information technology management, changes in processes, the use of unfamiliar and challenging IT and creative innovation strategies to cope with this different and dynamic marketing. According to Martell (1988), information technology accelerates changes in how marketing conducts its activities. Specifically, it enables firms to (i) track competitors’ pricing more efficiently and determine its own pricing structure; (ii) conduct market research more accurately and (iii) communicate and relay information more efficiently to others. Porter and Millers (1985) assert that utilization of information technology changes the production process, reduces costs, widens the arena of competition, and facilitates the creation of new business.

The Marketing Information Systems (MKIS) support the sales and marketing function by facilitating the movement of goods and services from producers to customers. Operating level MKIS include the telemarketing systems, contact information systems, prospect information systems and the direct mail advertising systems. They primarily produce routine repetitive, descriptive, expected and objective data that describe past marketing activities. The information they produce is usually detailed, highly structured, accurate, derived from internal sources, and produced regularly. The tactical marketing information systems often combine operational-level financial data with other data to support tactical decision making managers. They include the sales management information system, product pricing information system and the distribution channel decision support systems. The strategic level marketing information system helps in segmenting the market into target groups of potential customers based on common characteristics or needs or wants, selecting those market segments the organization wishes to reach, planning products and services to meet those customers’ needs, and forecasting sales for the market segments and products. They include the sales forecasting information systems, and the product planning and development information systems. (Strathmore, 2001)

B. Finance and Accounting

Technology is also heavily applied in the areas of accounting and finance. The systems here are those that maintain records concerning the flow of funds in the firm and produce financial statements, such as balance sheets and income statements. They are among the earliest systems to be computerized (O’Brien, 2002). Operational accounting information systems produce the routine, repetitive information outputs that every
organization finds necessary, including pay cheques, cheques to vendors, customer invoices, purchase orders, stock reports, and other regular forms and reports. The heart of an organization’s operational-level accounting information system is the financial accounting system. A computerized financial accounting system is composed of a series of software modules or subsystems used separately or in an integrated fashion. Such subsystems include the general ledger, fixed assets, accounts payable, accounts receivable and the payroll. When these computerized financial accounting subsystems are integrated, each subsystem receives data as input from other subsystems and provides information as output to other subsystems. Tactical accounting and financial information systems support management decision making by providing managers with: regular summary reports, regular exception reports, ad hoc reports and other information that helps them control their areas of responsibility and allocate their resources to pursue organization goals. The focus of tactical information systems is resource allocation. It is possible to design many computer-supported, tactical-level information systems for the financial decisions that managers must make. These include: budgeting systems, cash management systems, capital budgeting systems and the investment management systems. The Strategic-level Information Systems on the other hand are goal oriented and are designed to support organization goal and direction setting. They include the Financial Condition Analysis Systems and the Long-Range Forecasting Systems (Strathmore, 2001).

C. Human Resource Management (HRM)
Carlson et. al., (2006) affirms that the association between human resource management and firm’s performance is attracting a lot of research attention. Snell et. al., (1995) believed that information technology provides employees with access to HRM related information and also reduces response time to some employee concerns and enhance service. Human Resource Management Information Systems (HRMIS) have been widely used by many firms to improve their operations and reduce the cost of their operations. Specifically, the operational human resource information systems provide the manager with data to support routine and repetitive human resource decisions. Several operational-level information systems collect and report human resource data. These systems include information about the organization’s positions and employees and about governmental regulations. The tactical information systems provide managers with support for decisions that emphasize the allocation of resources. Within the human resource management area, these decisions include recruitment decisions; job analysis and design decisions, training and development decisions, and employee compensation plan decisions. On the other hand the strategic information systems assist in performing activities such as work force planning, labour negotiations, training and other specialised human resource functions (Strathmore, 2001).

D. Production/Manufacturing
Manufacturing execution systems collect information and keep track of manufacturer’s data such as capacity, yield, work in progress and machine status. The most common technologies applied in modern manufacturing process are the Just In Time (JIT) Manufacturing systems artificial intelligence (AI) and the Materials Requirement Planning (MRP). JIT manufacturing was first developed at Toyota in the 1960s by Taiichi Ohno as part of Toyota’s lean production process. JIT is the concept that parts are produced at each step in quantities sufficient only to supply the immediate demand of the next step. This concept was extremely difficult to implement because inventories between the different steps were practically eliminated, so if one small part was not available in the production process, the entire production system failed. To achieve the gains in productivity that are possible from JIT, real time sharing of information is needed between suppliers and buyers. (John, 2009).

Artificial Intelligence consists of computer based systems (both hard ware and soft ware) that attempt to emulate human behaviour. Such systems would be able to learn languages, accomplish physical tasks, use a perceptual apparatus and emulate human expertise and decision making. Although AI applications do not exhibit the breadth, complexity, originality and generality of human intelligence, they play an important role in contemporary knowledge management. (Ken et. al., 2010).

The materials requirement planning (MRP) concept was developed in the 1970’s following the introduction of high speed computers. MRP does the work of the materials manager to control inventory of items to lean the supply chain. The forecast of inventory items is controlled by the production item on which their demand is dependent. MRP is typically applied to manage inbound material movement in the enterprise and is based on the production requirements and scheduling (Sople, 2010). MRP was developed and refined by Joseph Orlicky at IBM and Oliver Wight, a consultant in the late 1960s and 1970s. A materials requirement plan is derived from the master production schedule (MPS), inventory records and the product structure. The product structure refers to a diagram or a list of materials and their quantities; usually called a bill of materials (BOM) needed to produce one item of output (Brason Steve et al, 2005). Lysons and Farrington (2006), point out that an MRP system has the following elements:

Master production schedules (MPS): The MPS uses the inputs from marketing and sales to forecast demand for quantities of the final product over a planned time horizon known as time buckets.

The bill of materials (BOM): also known as the product structure, this lists all the items that comprise each assembly and subassembly that make up the final product.

The inventory file: This is the record of individual items of inventory and their status.

Research by Krupp (2004) showed that traditional inventory management systems have been too complex to use successfully for many managers. A suitable planning and control system has to be put in place. Real time MRP comes in handy to reduce the effects of forecasting errors which are a major source of problems to any firm’s performance. Real time MRP approach has been modified by using route lead-time to estimate the customers’ order lead-time which would be less cumbersome.

E. Procurement and Supply Chain Management
Procurement is the process by which companies acquire raw materials, components, products, services or other resources from the suppliers so as to execute their operations. (Chopra, 2007). Lysons, and Farrington, (2006) point out that the procurement transactions begin with the buyer placing the order and end with the buyer receiving the order and paying for the goods. The most commonly technologies applied in the procurement processes are e-procurement and the order management system. Chopra (2007) explains that E-Procurement involves using the
internet to operate the transactional aspects of requisitioning, authorising, ordering and payment processes for the required services or products. E-procurement is typically the focus of local business administrators and covers various areas of the buying process such as requisitioning against the agreed contract, authorisation ordering, receipt and payment.

The key enabler of all the above is the ability of the systems to communicate across organizational boundaries. (Lysons, and Farrington, 2006). In implementing the e-procurement technologies, companies ought to choose the right vendors for the provision of the appropriate software after a thorough cost benefit analysis. (Maureen and Eric, 2000) however pointed out that the e-commerce market is changing so fast that whatever decision you make today, no matter how much due diligence is applied, will be wrong one tomorrow. So you might as well agonize over it and just pick one.

Using the Order Management system, orders can be received from businesses, consumers, or a mix of both, depending on the products. Offers and pricing may be done via catalogs, websites, or broadcast network advertisements. According to Lysons and Farrington (2006), an integrated order management system may encompass these modules:

- Product Information (descriptions, attributes, locations, quantities)
- Inventory Availability (ATP) and Sourcing
- Vendors, Purchasing, and Receiving
- Marketing (Catalogs, promotions, pricing)
- Customers and Prospects
- Order Entry and Customer Service (including Returns and Refunds)
- Financial Processing (credit cards, billing, payment on account)
- Order Processing (selection, printing, picking, packing, shipping)
- Data Analysis and Reporting
- Financials (Accounts Payable, Accounts Receivable, General Ledger)

An organization can therefore improve its performance by automating its order management processes and adopting technology that is aimed at increasing the efficiency and the effectiveness of the procurement process. The emergence of supply chain management has broadened the scope across which companies make decisions. This scope has expanded from trying to optimize performance across the division, to the enterprise, and now to the entire supply chain. This broadening of scope emphasizes the importance of including processes all along the supply chain when making decisions. From an enterprise’s perspective, all processes within its supply chain can be categorised into three main areas: processes focused downstream, processes focused internally and those focussed upstream. (Chopra, 2007)

The upstream portion of the supply chain consists of the company’s suppliers, the suppliers’ suppliers and the processes for managing relationships with them. (Ken, et al., 2010). The processes which focus on the interaction between the enterprises and the suppliers are known as the supplier relationship management (SRM). The main activities in SRM are design collaboration, sourcing, negotiating, buying and supply collaboration. Internal supply chain management is focussed on operations internal to the enterprise. ISCM includes all the processes involved in planning for and fulfilling a customer order. The various activities carried out in this case are strategic planning, demand planning, supply planning, fulfilment and field service. (Chopra, S. 2007)

The customer relationship management macro processes consist of processes that take place between an enterprise and its customers downstream in the supply chain. The goal of the CRM macro processes is to generate customer demand and facilitate transmission and tracking of orders. Weaknesses in this process results in demand being lost and a poor customer experience because orders are not processed and executed in effectively. The key activities under CRM are marketing, selling, order management and call/service centre. (Chopra, 2007)

The technologies used in managing the above supply chain macro processes are Electronic Data Interchange (section 4.5), the Enterprise Resource Planning (section 4.2) the internet (section 4.6) and Collaborative Planning, Forecasting and Replenishment (CPF) system. The CPF is a web based standard that enhances vendor managed inventory and continuous replenishment to reduce the variance between supply and demand. Trading partners use technology and a standard set of business processes for internet based collaboration on forecasts and plans for replenishing products. It builds upon efficient consumer response principles (Janat, 2009). CPF therefore is aimed at facilitating and improving collaboration between partners in a chain. When partners forecast independently, there is the possibility of a bullwhip effect, which results in higher inventory and poor customer service at the end customer level.

F. Logistics Management

Logistics is the science and practical management of the supply of materials. The Council of Supply Chain Management Professionals defines logistics as that part of the supply chain that plans, implements and controls the efficient, effective flow and storage of goods, services and related information from the point of origin to the point of consumption in order to meet customer requirements (ITC, 2006). In general terms, logistics describes the entire process of materials and products moving into, through and out of a firm. It describes all of the activities involved in securing the right type of materials, in the right quantity, in the right condition, to the right location and at the right times (Murphy et. al., 2008). The logistics function performs very crucial activities in an organization the most important being warehousing, inventory management and transportation. Various technologies have also been put in place in most organizations to assist them in conducting those functions. They include the warehouse management systems (WMS), the automated guided vehicle systems (AGVS) and the Logistics Information Systems (LIS).

The warehousing function is majorly concerned with the proper storage of raw materials, work in progress or finished goods. Many technologies are available in warehouse management but the most important include warehouse management systems (WMS) and Automated Vehicle Guided Systems (AGVS). The Warehouse Management Systems (WMS) are software packages concerned with meeting the two objectives of warehousing: maximizing the use of space, equipment and labour and exceed customer expectations. WMS accomplish the goals by directing labor, providing inventory and location control, and managing the flow of orders and processes in the warehouse. In essence, WMS are concerned with managing the opportunities within the four walls of the warehouse. One of the benefits of WMS technology is that it is real time and as a result, a WMS can support a reduction in
lead times in order processing and inventory management (Sople, 2010). WMS can deliver accuracy improvements, labour saving and better space utilization. The benefits can support better customer service and quicker turn on inventory, both of which provide financial savings in warehouse operations. Warehouse software vendors are also developing partnerships with ERP vendors because buyers are looking systems that are compatible with their existing brand of ERP software and database. (John, 2009).

The Automated Guided Vehicle System (AGVS) makes use of the magnetic or optical guidance system. The magnetic system uses an energized wire laid on the warehouse floor for guiding material handling equipment. In the case of the optical system, the light beam focusing on the guide path propels and guides the equipment. In AGVS, the role of the operator is eliminated. The new generation AGVS are guided by video and do not follow the fixed path. They are smaller in size and flexible in operations. The AGVS can perform all material handling operations without any human involvement. The robot coupled with AGVS is used to pick up precisely the material required for a customer order. The robot is a human like machine that can perform a variety of tasks. The robots can be programmed by a built-in microprocessor for performing many different tasks in the warehouse. The material handling complexity in terms of load and variety depends on the capability to incorporate artificial intelligence in the system. In high-rise or multi storey warehouses, the automated high-rise storage and retrieval systems (ASRS) are in use because of the greater attention to automated unit load handling in high-rise warehouses. This equipment operates at a speed range of 300-400 feet per minute horizontally and 100 feet per minute vertically (John, 2009).

Generally a Logistics Information System (LIS) is a must if the firm wants to reap the full benefits of logistics management automation. Sople (2010) explains that like the Management Information System (MIS), which is designed more for general management information needs, the LIS caters to the specific information needs for the decision making in the areas of logistics management. It is therefore required for coordination of activities such as order processing, order filling, and procurement, production scheduling, dispatching and responding to customer order status queries. The desired characteristics of LIS are information accuracy, timeliness and availability in the required format.

VI. Conclusions

1. The resulting benefits of using technology in an organization include improved productivity
2. Technology can lead to process efficiency and effectiveness as well as improved customer service if well utilized.
3. It is important for organizations to consider the interests of all stakeholders if they want to fully realize the benefits of implementing technology.
4. Managers can adopt technologies that support multiple areas/processes of the organization, e.g. the enterprise resource planning systems (ERP).

VII. Recommendations

1. Managers should ensure that the technologies adopted are feasible and strategically aligned with the overall business strategy for easy implementation.
2. Technologies should be used to improve the entire supply chain for sustained competitive advantage since this helps in minimizing system wide costs.
3. Companies should ensure that they select technologies of the correct type, size and scope for better functioning of the systems in place.
4. All technical and business philosophy issues should be addressed as fast as possible because they bring significant changes into a company’s conventional business model and the day to day practices.
5. All stakeholders in the organization should be involved at the planning stage to avoid resistance to change and take care of the human nature that never accepts any change without seeing the visible advantages of it.

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Author's Profile

Kitheka Samson Samuel is currently an Assistant Lecturer at the Technical University of Mombasa, in the department of Business Studies. He holds a first class honours degree in Business Management (BBM) from Masinde Muliro University and a Master of Business Administration (MBA) in Procurement and Supply Chain Management from the University of Nairobi (UoN). Kitheka is currently a doctorate student (PhD in Business Administration) at the Jomo Kenyatta University of Agriculture and Technology (JKUAT) Kenya, and has taught Procurement and Supply Chain Management courses in Both Masinde Muliro University of Science and Technology and the Technical University of Mombasa. Kitheka is also a Certified Public Accountant (CPA) and was previously working in the telecommunications industry before joining the Academia. Kitheka has research interests in Procurement, Supply Chain Management, Logistics Management and Finance.


