

SUPPLY CHAIN IN THE NEW ECONOMY: AN APPROACH BASED ON KNOWLEDGE MANAGEMENT

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Abstract

Regardless of what it is called, “the new economy” is today's reality. Besides, it is the main interest of managers who presently focus on supply chain management. Similar to supply chain management, “the new economy” depends on the information and communication technologies (ICT) to achieve organizational effectiveness. The knowledge management systems in the new economic structure emphasize how firms can enhance competitive advantage through more effective utilization of their knowledge assets. In this study, a knowledge structured supply chain is utilized to underline the fact that all the members of a chain have a knowledge management system and there are effective information flows among the chain members.

Keywords: *New Economy, Knowledge Management, Supply Chain Management.*

1 THE NEW ECONOMY

For a brief period covering the late 1990s and the early 2000, it was apparent that the business world was characterized by an almost unbounded sense of optimism with certain opportunities. The utopian aspirations of that period, with visions of hope and progress, put the ‘New Economy’ into most peculiar fin-de-siècle phenomenon (Cock et al., 2005; 37).

In the new world, the new economy has become a symbol of change. It is generally believed that United States has become a ‘New Economy’ in which business firms have learnt to take advantage of both Information and Communication Technologies (ICT) revolution and the globalization of business activities in ways which improve productivity (Jalava, Pohjala, 2002, 190).

Cohen et al. (2000) point out, the ongoing transformation of our economy has been given many names: a post industrial society, an information society, an innovation economy, a knowledge economy, a network economy, a digital economy, a weightless economy, and an e-economy. They all have their merits in emphasizing the different aspects of the structural change but also vulnerable to misinterpretation (Pohjola, 2002b, 134).

Globalization, technology and new economy are creating waves of change and uncertainty which we called as third wave. Source of power for this wave, which arises from ideas, is information and knowledge (Siriram, Snaddon, 2004; 779).

Drivers behind the new economy are (Handfield, Nichols, 2002; 87):

- Strategic integration
- Globalization of markets
- Availability of powerful information systems and technology
- The need for new business process
- The need to replace obsolete systems
- The need to continually reduce cost throughout the supply chain

From this point of view, this study aims to propose a knowledge based supply chain structure.

2 KNOWLEDGE AS A PART OF NEW ECONOMIC STRUCTURE

Knowledge is nowadays considered to be a fundamental asset of the organizations. One definition of knowledge with an appropriate knowledge management perspective is “comprising a set belief which informs decisions by agents to take actions that consume the agent’s (scarce) resources” (Boisoti, MacMillan, 2004, 506).

The literature has been unable to agree on a definition for the term ‘knowledge management’. One reason is for this is there are more than one perspective that try to explain knowledge management (KM) such as information system perspective, innovation management perspective, some definitions in management literature and multi-disciplinary approach (Pouloudi et al. 2003; 53) of knowledge management. Wiig (1995) proposes that knowledge management is a group of clearly defined processes or methods used to search important knowledge among different knowledge management operations (Liu et al 2005, 637).

KM is a systematic and organizationally specified process for acquiring, organizing and communicating both tacit and explicit knowledge of employees so that other employees may make use of it to be more effective and productive in their work (Alavi, Leidner, 1999 in Ravishankar, Pan, Omega 2006). What is described, in this definition, is the main two types of knowledge and how it is shared among the employees. Sharing knowledge inside and outside of the organizations is the same as it is in a supply chain (Numprasertchai, Igel, 2005, 1175-1178).

Information and communication technologies (ICTs), technologies suitable to effectively way of managing knowledge, have become a key element to improve the organizations performance (Numprasertchai, Igel, 2005, 1175). ICTs can help an organization to capture, distribute useful information and knowledge, and manage easy. They also applied to make an apparent relationship between information and knowledge to manage them inside and outside of the organizations (Numprasertchai, Igel, 2005, 1175-1178).

The rising of new economy depends on the development of ICTs, and with the digital life knowledge sharing gets much easier than before. In the sectors timing is very important, new economy tools have a crucial role. One of these sectors is logistics sector and supply chain management.

KM systems emphasize how firms can enhance competitive advantage through more effective utilization of their knowledge assets (Newell, 2003; 27).

One of the main objectives of KM research and practice is to facilitate effective and efficient knowledge-sharing among organizational members (Shin, 2004, 179) not only within an organization but also among organizations.

KM approaches in literature are shown in Table 1.

Approaches	Main Focuses
<i>Technological</i>	Enhancing KM quality by supplying tools for effective storage and distribution of knowledge
<i>Intellectual Asset</i>	Enhancing KM quality by valuing knowledge assets in financial terms and reflecting them in accounting practices
<i>Organizational Learning</i>	Facilitating knowledge creation and sharing by developing positive work environment or effective reward systems
<i>Process</i>	Enhancing KM quality by identifying key processes on which important knowledge flows and managing them formally
<i>Philosophical</i>	Gaining a higher understanding of knowledge lead by asking questions towards development of new ways of thinking 'do we know what we don't know'

Table 1. *Knowledge Management Approaches.*

Source: *Shin, 2004, 180*

Evolution of the knowledge management applications that are shown in Table 2 are in parallel with the development of the economy. As it has been mentioned before, late 1990s is the starting point of the new economy with the development of ICT'. At the same time, onward 1990s we can see that suppliers or other business partners can access the information easily with the tools that create and share information and knowledge.

Wave	Age	Year	Important activities	Milestones
1	Introduction	Pre-1995	Group Memory Systems	Discussion boards or bulletin boards
2	Growing	1995-2000	Corporate Intranets and Decision Support Portals	Data aggregation and analysis enabled by decision support portals built on corporate intranets
3	Maturity	Late 1990 to present	Extranets and inter-enterprise Portals	Suppliers and trading partners can access internal corporate information
4	Current	Late 1990 to present	E-commerce and Click Stream Analysis	User click-stream analysis, e-mail management, knowledge portals.
5	Future	Business Intelligence	Content organization and collection, analysis and segmentation, real-time personalization, broadcast, retrieval and interaction

Table 2. *Evolution of Knowledge Management Applications*
Source: *Oppang et al. 2005, 418.*

One approach for knowledge is KP³ methodology. This methodology is ‘the first attempt assessing the contribution of knowledge to the business performance through product and process. It consists of four components: knowledge, process, product and performance. Knowledge is further classified into two: product-related knowledge and process-related knowledge. And with this approach knowledge and business performance can be related, at the same time it gives us the way of using knowledge strategically (Ahn, Chang 2004; 405-414).

3 A KNOWLEDGE MANAGEMENT APPROACH BASED ON SUPPLY CHAIN MANAGEMENT IN THE NEW ECONOMY

3.1 Definition of Supply Chain and Its Evolution

In the industrial world the main interest of managers is presently focused on supply chain management. Managing the different types of physical, information and financial flows in these networks becomes a real challenge for managers and researchers (Villa, 2001, 1-4).

A supply chain is the set of value-adding activities that connects a firm’s suppliers to the firm’s customers (Harrison, 2001, 413). Supply chain management (SCM) is the process of

planning, organizing, and controlling the flow of materials and services from suppliers to end users/customers (Bloomberg, LeMay, Hanna, 2002; 1).

The SCM concept could be held in five management stages. The first stage can be described as the era of internal logistics departmentalization. In the second stage, logistics began the migration from organizational decentralization to centralization of core functions driven by new attitudes associated with cost optimization and customer service. Stage three can be called as integrated logistics management. Stage four is supply chain management era with the strategic view of supply chain and after 2000s can be called as e-supply chain management era. Table 3 shows the evolution of supply chain with the management focus and organizational design (Ross, 2003, 5-6).

SCM Stage	Management Focus	Organizational Design
Stage 1 to 1960	<i>Warehousing and Transportation</i> Operation performance Support for sales/marketing Warehousing Inventory control Transportation efficiencies	Decentralized logistics functions Weak internal linkages between logistics functions Little logistics management authority
Stage 2 to 1980	<i>Total Cost Management</i> Logistics centralization Total cost management Optimizing operations Customer service Logistics as a competitive advantage	Centralized logistics functions Growing power of logistics management authority Application of computer
Stage 3 to 1990	<i>Integrated Logistics Management</i> Logistics planning Supply chain strategies Integration with enterprise functions Integration with channel operations functions	Expansion of logistics functions Supply chain planning Support for TQM Expansion of logistics management functions
Stage 4 to 2000	<i>Supply Chain Management</i> Strategic view of supply chain Use of extranet technologies Growth of co evolutionary channel alliances Collaboration to leverage channel competencies	Trading partner networking Virtual organizations Market co evolution Benchmarking and reengineering Supply chain TQM metrics
Stage 5 2000 ...	<i>e-Supply Chain Management</i> Application of the internet to the SCM concepts Low-cost instantaneous sharing of all databases e-information SCM synchronization	Networked, multi-enterprise supply chain .com's, e-tailers and market exchanges organizational ability and scalability

Table 3. *Supply Chain Management Evolution*

Source: *Ross, 2003, 6*

In the new economy, e-commerce, e-markets are raised. An e-marketplace can be treated as a physically and logically distributed system of interacting autonomous business entities. Yet, there is a need for well-accepted interoperability standards, which must be meshed for supply chain integration to meet business demands. Conceptually, a supply chain manages coordinated information and material flows, production operations and logistics of the e-marketplace (Ghenniwa, Huhns, 2004; 53). So if supply chain is a process which needs information. .

3.2 The Need and Importance of Knowledge Management in Supply Chain

In the new economy, companies are setting up or expanding e-commerce systems and are therefore, seeking new capabilities for managing web-based interactions with their suppliers, partners and customers. The effective use of knowledge is a key component in every successful organization, no matter what field or business function they may be in or what services the organization provides (Oppong et al., 2005, 414-415).

In supply chain decision making, autonomy is important for the flows. This autonomy defined in terms of proper knowledge of constraints which must be satisfied in order that the global network can survive and a proper set of information concerning operations performing by other nodes in the network (Villa, 2001; 3).

In the last decade, firms achieve competitive advantage through heterogeneous, specific, and difficult-to-imitate resources that include intangible assets, such as customer and supplier information. It is not just a firm's assets, but how they are leveraged across supply chains that provide competitive advantage (Zahay&Handfield, 2004; 628). Lack of information or distorted information passed from one end of the supply chain to the other can create significant problems, including but not limited to, excessive inventory investment, poor customer service, lost revenues, misguided capacity plans, ineffective transportation, and missed production schedules (Handfield, Nichols, 2002; 295).

The information sharing among organizations has been realized by interorganizational information systems (IOS) for 40 years (Williamson et al 2004,376) and the development of IT in supply chain has 4 phases (Shore, 2001, 30-31);

Phase 1: Paper copies of purchase orders, bills and invoices and represents most of information flows. Information technology and telecommunications do not contribute significantly to the information system.

Phase 2: The development of electronic data interchange (EDI) that had a dramatic effect on the automation of information flows and the elimination of many labour intensive processes and procedures in partner business.

Phase 3: A more integrated approach, enterprise-wide systems and databases are integrated and coordination of information technologies (IT) operations takes place.

Phase 4: The supply chain is defined by strategic supplier partnerships with extensive two-way information flows.

In the new economy, strategies depends on mainly technology and information. Supply Chain is a concept formed by processes. The integration of supply chain processes can provide an effective means by which costs can be reduced and customer service levels improved. The formula for integration, however, is not a simple one. Organizations that aim to become part of an extended, integrated supply network can also expect that this will require an

infrastructure enabling effective information flows and streamlined logistics. A key component of this infrastructure will be based on robust and durable collaborative arrangements with trading partners. The most effective of these networks will be those that are able to get the mix of information requirements, physical logistics and collaboration right, providing shared benefits to a majority of partner organizations (Power, 2005). The basis of integration can therefore be characterized by cooperation, collaboration, information sharing, trust, partnerships, shared technology and a fundamental shift away from managing individual functional processes, to managing integrated chains of processes. Effective application of information technology to the integration of supply chain activities has the effect of reducing levels of complexity (Eris et al., 2006, 102) and this study is based on this thinking.

3.3 Knowledge Structured Supply Chain in the New Economic System

Knowledge management systems emphasize how firms can enhance competitive advantage through more effective utilization of their knowledge assets (Newell, 2003; 27). A knowledge structured supply chain can be described that all the chain members have a knowledge management system and there are effective information flows with the chain members. A basic conceptual model can be formed as Figure 1.

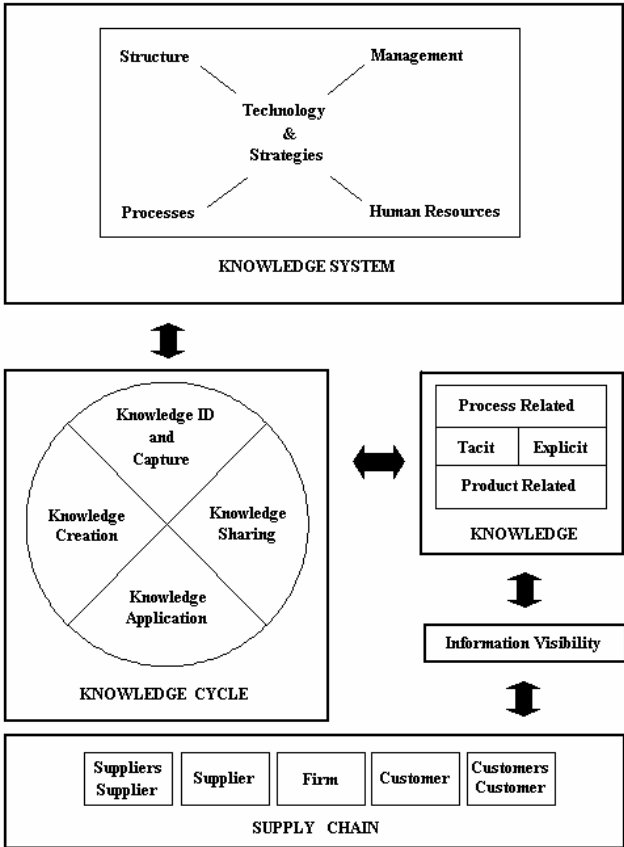


Figure 1. Conceptual Model of Knowledge Based Supply Chain

3.3.1. Knowledge System

In his study, Söderquist (2006) identifies three types of organizational structure for KM. *A central KM function* is where a team of specialists, headed by a Chief Knowledge Officer (CKO), were in charge of KM related activities in all development projects. *A project decentralised KM task force* is where the responsibility for managing knowledge was internal to each development project and assigned to a task force headed by a leader reporting to the project manager. *Functionally located KM*, including developing state-of-the-art knowledge in support of product development projects and disseminating knowledge to project groups was the responsibility of a cell within the specialized functional departments (Söderquist, 2006, 503-504). In this context organic organizational structure is needed. Cobbenhagen (2000) is identified the organic structure of an organization in a the dynamic and complex environment, as characterised by: *frequent lateral as well as vertical interaction, decentralised decision processes, a network structure of control, authority and communication, collective responsibilities, co-ordination by consultation, flexibility* (Cobbenhagen,2000,188).

Management components in successful SCM are described by (Brewer et al, 2001;118) mainly in two components, *physical and technical management* and *managerial and behavioural management*. Physical and technical management components are consists of planning and control methods, work flow / activity structure, organization structure, communication and information flow facility structure and product flow facility structure. Managerial and behavioural management components are management methods, power and leadership structure, risk and reward structure, culture and attitude. These components and their sub context are also needed for the supply chain management in the knowledge based economy.

The key supply chain processes identified by members of The Global Supply Chain Forum are *customer relationship management, customer service management, demand management, order fulfilment, manufacturing flow management, procurement, product development and commercialization, returns* (Brewer et al, 2001; 109). Most firms are dealing with a myriad of supply chain challenges such as increased transportation costs, capacity issues across multiple modes, driver shortages and port congestion that have forced many to re-think their logistics network. The main part of logistics network is supply chain. And for a world class supply chain excellence to be the best in SC processes there are six main drivers -*collaboration, optimization, connectivity, execution, speed, visibility*- depends on information, knowledge and technology that firms affected. These six drivers contain (Manrodt et al., 2006; 2-5) as follows;

- Collaboration
 - o Share real time data with key customers, suppliers and partners
 - o Align individuals and organizations
 - o Standardize processes and practices
- Optimization
 - o Implement new tools and processes
 - o Eliminate inefficiencies
 - o Leverage cost saving across
 - o Supply chain members

- Connectivity
 - o Standardize applications and platforms
 - o Foster many-to-many collaboration
 - o Enable trade exchange
- Execution
 - o Improved transportation, distribution inventory and other management
 - o Expedite financial settlements
 - o Measure performance results
- Speed
 - o Increased responsiveness
 - o Improved adaptability
 - o Access information in real time
- Visibility
 - o Track inventory flow
 - o Update order status in real time
 - o Manage incidents

It has been clearly identified that there is a skills shortfall at some management levels (http://www.skillsforlogistics.org/ssa_iss1.shtml). Strategies to develop more responsive supply chains require a new perspective on human capital (Butcher et al., 2006; 60). Mangan&Christopher (2005) has identified the skills for supply chain managers as analytical, interpersonal, leadership skills, being good in change management, and be able to manage the projects (Mangan, Christopher, 2005).

Many tools to support KM have been developed in the last years. Some technologies can enable the knowledge of an individual or a group to be extracted, structured, and used by other members of the organizations. Their most valuable aims are the extension of the knowledge span, the increase of knowledge transfer/share speed, the support to knowledge codification (Garavelli et al. 2002; 269-279).

Most of KM researches and practitioners stress three major components of a KM strategy: people, process/culture and technology (Love et al., 2005; 11) which are also the main actors in supply chain and all the strategies are around these actors. With the developing trends in e-commerce, supply chain has got a new form. One of the new trends in SC is “web-based supply chain”. According to Ganeshan, new supply-chain management should have, customer and employee self service, vendor managed inventory and automatic replenishment, collaborative planning, forecasting and replenishment, and the emergence of exchanges. And also six major trends and the sub-factors that driving the deployment KM strategies are *customer oriented trends, e-service trends, organizational trends, employee megatrends, enterprise technology trends and general technology trends* (Oppong et al., 2005; 433/420).

Table 5 summaries the knowledge management system dimensions.

3.3.2. *Knowledge Management Cycle*

KM Cycle consists of four major stages -*capture, sharing, application and creation*- and is used to support the framework that is data, information, knowledge and individual-organizational processes in a learning concept. Knowledge is identified and captured, shared

with others, applied in combination with existing pertinent knowledge and then created in the form of new knowledge which is then captured and continues (Liebowitz, 2005; 3-6).

3.3.3. Knowledge

There are types of knowledge in organizations. Basically, two typical types of knowledge are created and shared/transferred in organization, explicit and tacit. Knowledge that are created and shared/transferred in organizations related with products and processes. Product knowledge is knowledge directly related to the company's specific product and process knowledge associated with the activities performed in each stage of a value chain from inbound logistics to customer care (Ahn, Chang 2004; 406).

	Tacit	Explicit
Product-related	Know-how (human brain)	Knowledgebase (Knowledge repository)
Process-related	Human capability (Human brain and culture)	Workflow (Workflow system)

Table 4. Knowledge Types in Organization

Source: Ahn, Chang 2004

3.3.4. Information Visibility

Information visibility within supply chain is the process of sharing critical data required to manage the flow of products, services and information in real time between suppliers and customers. If information is available but cannot be accessed by the parties most able react to given situation, its value degrades exponentially. Increasing information visibility between supply chain participants can help all parties reach their overall goal of increased stockholder value through revenue growth, asset utilization and cost reduction. To improve responsiveness across their supply chains, companies are exploring the use of collaborative models that share information across multiple tiers of participants in supply chain (Handfield, Nichols, 2002; 298).

	Main Dimensions	Sub Dimensions
Structure	Central KM Function A project-decentralised KM Function Functionally Located KM Function	Frequent lateral as well as vertical interaction Decentralised decision processes A network structure of control, authority and communication Collective responsibilities Co-ordination by consultation Flexibility
Management	Physical & Technical Management Components	Planning and control methods Work flow / activity structure Organization structure Communication and information flow facility structure Product flow facility structure
	Managerial & Behavioural Management Components	Management methods Power and leadership structure

		Risk and reward structure Culture and attitude
Processes	Customer Relationship Management Customer Service Management Demand Management Order Fulfilment Manufacturing Flow Management Procurement Product Development and Commercialization Returns	Collaboration Optimization Connectivity Execution Speed Visibility
Human Resource	Managers / Directors / Leaders	Analytical Skills Interpersonal Skills Leadership Skills Change Management Skills Project Management Skills
	Employees	Using Information Systems Non-repeat works High self control Having initiative High profession
Technology	Information&Communication Technologies	Expert systems Distributed hypertext systems Document management Geographic information systems Help desk technology Intranets Concept mapping Semantic networks Hypertext (an expanded semantic network) Information modeling Conceptual indexes Metadata
Strategy	Customer Oriented Trends	Faster service Self service More product choices Integrated solutions
	e-Service Trends	Intagrated Sales and Services Seemless Support Flexible Increased Process Visibility
	Organizational Trends	Outsourcing management Contract manufacturing Virtual distribution Integrated solutions to the size

		Sophistication of customer base
	Employee Megatrends	Hiring the Best and Brightest Workers Keeping Talented Employees
	Enterprise Technology Trends	Integrated enterprise applications Multi-channel integration Middleware
	General Technology Trends	Wireless web applications Handheld computing and information appliances Infrastructure convergence Application service providers

Table 5. Dimensions of Knowledge Management System

Source: Kidd 1994, Saharaoui, Gupta et al., 2004, 18-19; Cobbenhagen, 2000, 188.

3.3.5. Supply Chain

In the supply chain is a value chain. In this chain, information flow is one of the important things because knowledge is the most valuable asset for business. In this chain, buyers and suppliers can have extended reach into partners' systems and are able to view operational information (Williamson et. al., 2004, 381). An efficient inter organizational knowledge management system can make the supply chain more value created.

4 CONCLUSION

As it's generally accepted, economy has turned into a knowledge economy and has been given many names such as post industrial society, an information society, an innovation economy, a knowledge economy, a network economy, a digital economy, a weightless economy and an e-economy. Increasing importance of knowledge caused firms to understand the necessity of operating in a supply chain. When developments resulting with the supply chain investigated, there are some milestones to be noted. In the 1960s, decentralized logistics function was realized in organizational design. In 1990s, the expansion of logistics management functions caused the birth of supply chain. In 2000s, supply chain was realized in electronic environment. In order to maximize the benefits of a supply chain, members of supply chain should pay attention to knowledge management approach. Hence, a knowledge management model is developed related with supply chain management. In the conceptual model, knowledge types and knowledge cycles among the members were identified. The next step of this study is to use this model in real life.

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